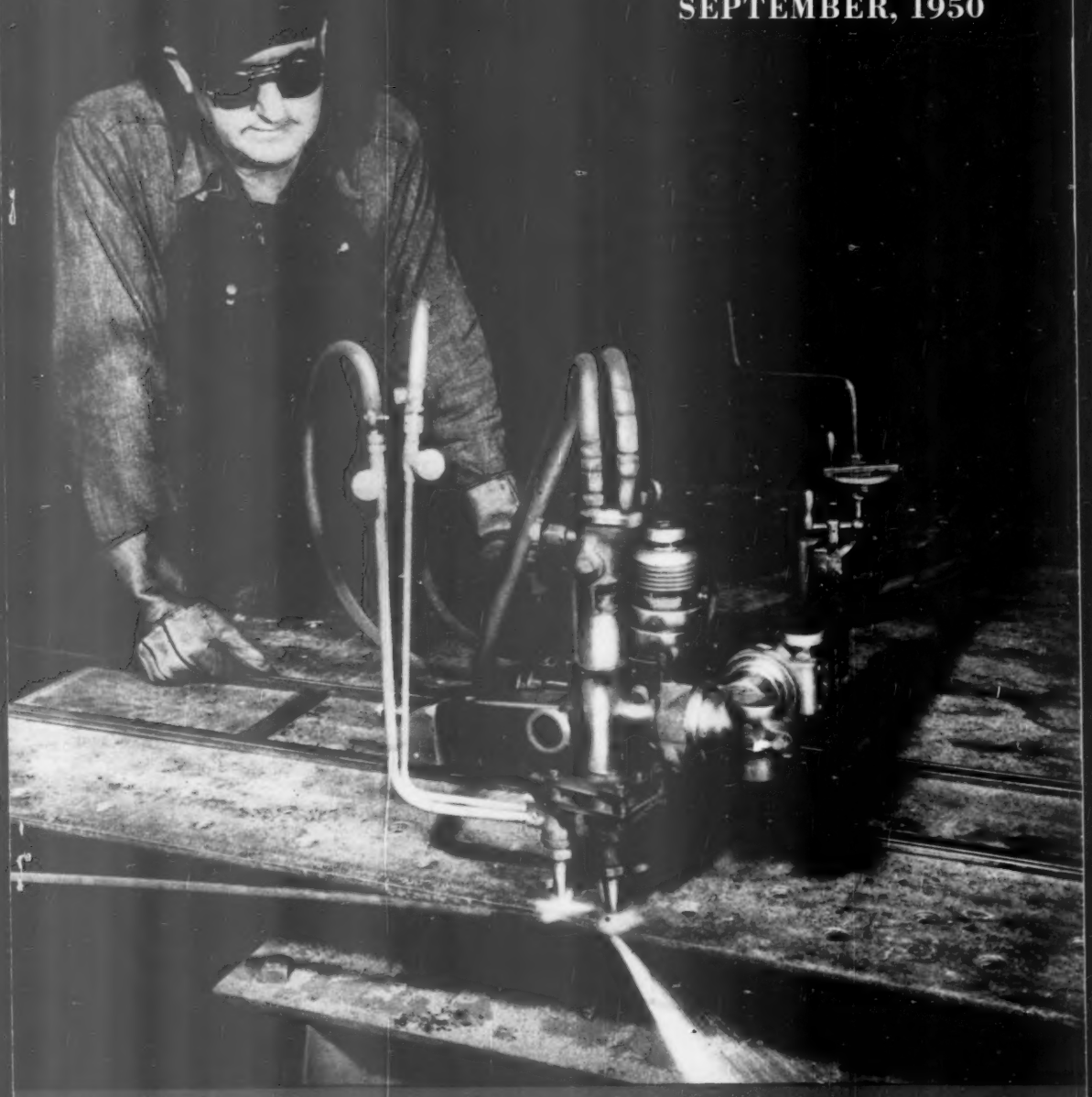
THE WELDING ENGINEER

SEPTEMBER, 1950



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A McGRAW-HILL PUBLICATION

Belden Welding Cable meets the basic requirements for efficient service:

1. It is full size to conduct the low-voltage current efficiently to the electrode.

2. It is flexible to make for ease of handling.

3. It has a TOUGH insulation for long life.

4. Its conductor is protected with a Kraft paper and aluminum foil separator — to prevent slippage between conductor and jacket and to keep the conductor bright and assure good connections.

This balanced construction gives you cost-cutting service. Try this cable in your severest operations — now. Then you will specify Belden.

Belden Manufacturing Co.,
4677-A W. Van Buren St.,
Chicago 44, Iilinois

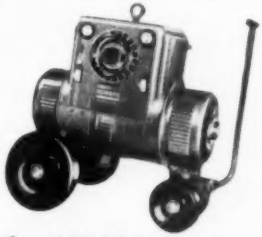
Belden
Welding **CABLE**

Today's biggest welder values!

HOBART "Pipeliner" 250 ampere gas dr. welder

The new HOBART A.C.

Efficient and quiet with no moving parts—not even a fan. Dual Control; Remote Control; "Pre-Surge" Inherent Arc Striking; Power Factor Correction; and many other features bring you new economy and speed in A.C. welding.

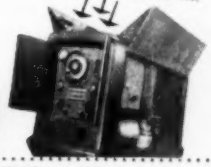


The HOBART D.C.

Ideal for production, maintenance, repair, and salvage welding in factories and shops. Made in 150, 200, 300, 400, and 600 ampere sizes, stationary or portable. Liberal ratings based on 60% duty cycle. Gives you more for your money.

The Combination A.C.-A.C.

Actually two machines in one. Flip a switch and have either a full capacity A.C. Welder or a Power Plant for operating lights, tools, appliances, etc.



LIGHT WEIGHT...EXTRA CAPACITY...EXTRA PEP...EXTRA LONG LIFE...YET COSTS LESS!

Faster, Smoother Welding The new "Pipeliner" was especially designed to speed up pipe line jobs. It has the typical Hobart characteristics of extra capacity and plenty of push behind the arc. Simplified controls provide for fine adjustment of wide welding range.

Lighter, but not skimped Rugged and compact, and economical to operate, this unusual unit is eager to meet every field condition. It can be loaded easily on a truck and hauled to the job.

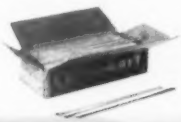
Built to Stand the Gaff Pipe line construction calls for long hours of steady welding—grueling punishment for the average welder. But the new Hobart "Pipeliner" takes such hard usage in its stride. Delivers 1 KW Auxiliary DC Power for lights and small tools besides. No matter what your arc welder requirements may be, it will pay you to write.

HOBART BROTHERS COMPANY
BOX U-90, Troy, Ohio, U.S.A.

"One of the world's largest builders of arc welders"

HOBART Simplified arc WELDERS

You'll like the Hobart No. 10 Rod If you are welding pipe lines, boilers, storage tanks, ships, or structural fabrications you'll find the Hobart No. 10 Electrode is just right. Sizes 1/8" through 1/4". Samples on request.



☐ Transformer Welder ☐ Pipe Line Special ☐ Electric Drive D.C. Welder ☐ Generator to "Build Your Own" ☐ Gas Drive 300 amp. ☐ D.C. Welder-D.C. Power ☐ A.C. Welder-A.C. Power ☐ Hobart Weldmobile

Check and mail to:
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BOX U-90, TROY, OHIO, U. S. A.

With no obligation, please send information on HOBART Arc Welders and other items checked.

Our work is _____

NAME _____ POSITION _____

FIRM _____

ADDRESS _____

Free!

☐ Catalog showing complete line of Hobart A.C. and D.C. Arc Welders

☐ Catalog on Hobart Electrodes

☐ Catalog on Hobart Accessories

6 REASONS why welders prefer CESCO

HEADBAND
COMFORT-KING round moulded rubber headband holds goggles firmly with reduced tension. No twisting or kinking—permanent slip-proof fit without constant adjustment.

CUPS
Moulded plastic; tough, nonflammable. Anatomical shaping assures even distribution of weight and perfect sealing against light leakage.

SIDESHIELDS
Shielded ventilation ports permit entrance of air while excluding light and flashes. Non-corrosive.

LENS RINGS
Strong, non-binding, screw type lens rings allow quick and easy replacement.

FILTER LENSES
Have high optical and filtration qualities. Meet Federal specifications. Each etched with trademark and shade number.

NOSEBRIDGE
Simple, sturdy. Insulated ball-chain bridge is comfortable and easily adjusted.

CESCO's improved lift-front type Welding Helmet combines all the qualities of safety, comfort and durability. It's your best buy!

For better visibility and quality, use **CESCO filter lenses** and **Perma-Clear cover lenses.**

● Good Welding Goggles combine comfort with positive protection from welding glare, ultra-violet and infra-red rays. Careful study and designing by CESCO engineers have produced top-quality welding goggles that provide both these elements. There are 5 basic types of CESCO Welding Goggles to meet your requirements. We'll be glad to send you complete information. Write today!

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FREE! *Send your name on company letterhead for CESCO's handy vest pocket notebook*

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THE WELDING ENGINEER

THE WELDING ENGINEER, *with which is combined The Acetylene Journal*

A McGRAW-HILL PUBLICATION

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SEPTEMBER, 1950

COVER: Two-torch straight-line cutting machine flame-softens silicon steel simultaneously with the cutting. See page 58. Photo courtesy Air Reduction Sales Co.

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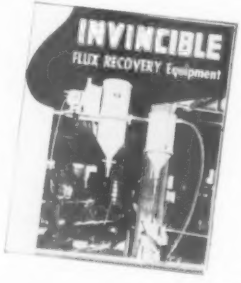
New INVINCIBLE

Model 490 Welding Flux Recovery Unit...

Salvages Valuable Flux
Saves Costly Man-Hours
Speeds and Improves Welding

This compact, flux recovery unit is especially designed for use with *portable* submerged arc welding equipment. Model 490 has a primary separator tank to remove harmful flux "flour". Synchronized control valves insure immediate discharge while motor is running. Adjustable insulated cup provides safe, convenient support and shut off for open bottom hoppers. Height 56"; Width 26"; Length 56"; Weight 360 lbs.

The Complete Line of Invincible Flux Recovery Units includes the Correct Size and Type for EVERY submerged arc welding installation.



FREE Folder on Flux Recovery

Describes and illustrates the *complete* Invincible line — includes installation views — send for your copy *NOW!*

INVINCIBLE VACUUM CLEANER MFG. CO.

DOVER, OHIO

FOR 40 YEARS, LEADERS IN INDUSTRIAL VACUUM EQUIPMENT

What are you welding today, Joe?

"PIPE LINES...and better than ever with G-E W-22 and W-52 ELECTRODES!"

Like Joe and his friends, you, too, will find that G-E Types W-22 and W-52 electrodes have been recently improved for all positions, especially for down-vertical welding on pipe. Also recommended for structural frames, pressure vessels, and shipbuilding.

W-22 is an AWS E6010 electrode, reverse polarity d-c, all positions. It produces welds of excellent appearance, high tensile strength, ductility, and high impact resistance. **W-52** is an AWS E7010 electrode, reverse polarity d-c, all positions. Recommended where a minimum of 70,000 psi is required; principally for welding low-alloy steels.

Regardless of what you are welding, the more than 70 types of G-E arc-welding electrodes **assure you of just the right rod for your job.** Your G-E Welding Distributor maintains a complete stock of G-E electrodes to meet your specific needs. Ask him for a copy of the handy pocket-sized G-E Electrode catalog, GEC-482. Or write: **Apparatus Department, General Electric Co., Schenectady 5, N. Y.**

ARC WELDERS • ELECTRODES
ACCESSORIES • RENEWAL PARTS

GENERAL ELECTRIC

NEW Aircomatic® Process jumps Welding Speeds to NEW HIGHS

Aircomatic is a new metal arc welding process that permits high-speed welding of aluminum, of aluminum bronze and of stainless steel – *in all positions.*.

The process uses a bare wire electrode in coil form, continuously fed to the work within an inert gas shield. High current densities are used providing excellent penetration and high deposition rates, *permitting welding at speeds greater than ever before possible.*

Aircomatic welding has proved most economical . . . for its high deposition rate, in addition to permitting high travel speed, also makes possible fewer passes on heavy material, and faster, heavier deposits for overlay or build-up work. This means more weld per unit of arc time, whatever the job. Further, since the wire is bare and continuously fed through a shield of inert gas, electrode changes and slag removal interruptions are eliminated, thus permitting almost 100% arc time in using the high operating speeds.

SAVES 16 MAN-HOURS WELDING TIME . . . Dempster Brothers, Incorporated of Knoxville, Tenn., makers of the nationally-known "Dempster-Dumpster" found Aircomatic welding cut their aluminum container manufacturing costs.

The other method was slow – cumbersome, and ran the cost exceedingly high. With Aircomatic the same container was produced – at a welding cost reduction of approximately 16 man-hours.

Another important feature of Aircomatic welding is its minimization of distortion. This is due to its high speed operation (heat can be concentrated and moved rapidly along the work), plus the fact that a small amount of weld metal is all that's required in most joints.

The case studies on the opposite page show how this dramatic new welding process is helping others. While the facts and figures are startling, they could very easily be applied in your own shop . . . but find out for sure. Write . . . or phone your nearby Airco office. Ask for a copy of ADR 66: "Aircomatic Welding Process".

SAVES 4½ HOURS . . . Martin-Quaid Co., of Philadelphia, Pa., used the New Aircomatic Process to reduce the time and cost of welding huge stainless steel cylinders used in the manufacture of carpets. They found this revolutionary process cut materials cost 25% . . . and saved 4½ hours working time over the old method – and, at the same time, greatly increased the quality of the finished product.

REDUCES TIME ⅕'s . . . Consolidated Welding and Engineering Company, of Chicago, Ill., adopted the new Aircomatic process for welding aluminum separators. Immediately, major production and cost problems were solved: To weld one complete separator assembly took only 90 man hours – about 1/5 the time of other methods.

Further, Aircomatic's high current density and the attendant high welding speed confined the heating effects to the narrow weld-zone . . . completely eliminating distortion.

ELIMINATES LEAKS . . . Griffin & Company, of Louisville, Ky., found Aircomatic's high speed and the ability to make welds without interruption ideally suited to the fabrication of tanks for all-aluminum evaporative coolers. Production time and cost was cut to the minimum, and warpage and distortion were completely eliminated. Thus far, the company has made hundreds of these tanks without a single leak.

BOOSTS PRODUCTION 71% . . . The Stewart-Warner Corporation, South Wind Division, Indianapolis, Ind., join the upper and lower halves of its "Safe-Air Gas Home Heater" with the completely new, high-speed Aircomatic Process. This time-saving, cost-cutting process skyrocketed production 71% . . . and cut manufacturing costs in proportion.

See Aircomatic in Operation at our Booth—No. 422 • Chicago National Metal Show October 23-27, 1950.

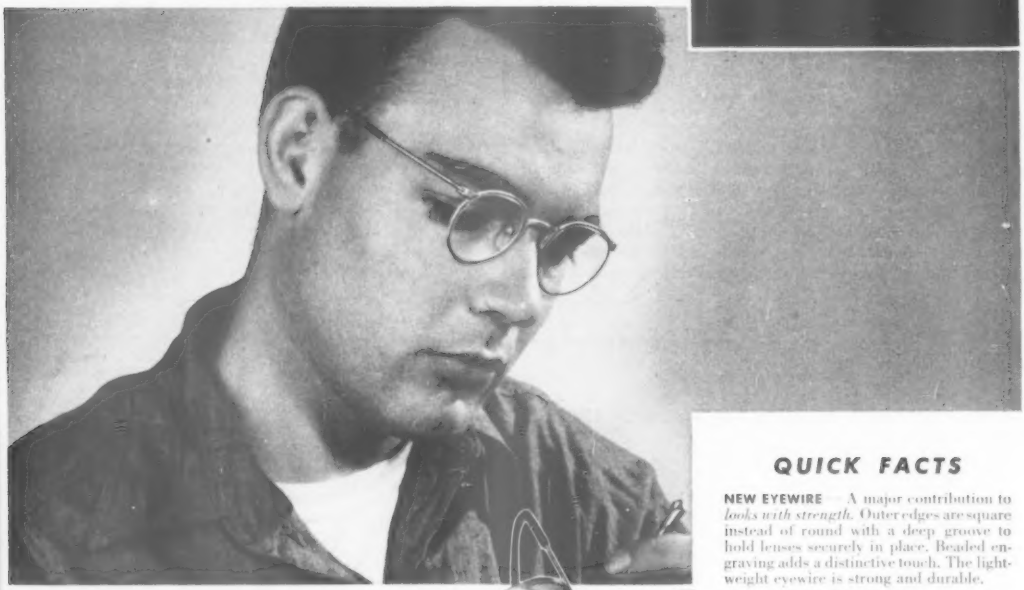
AIRCO AIR REDUCTION

Offices in Principal Cities

HEADQUARTERS FOR OXYGEN, ACETYLENE AND OTHER GASES . . . CALCIUM CARBIDE . . . GAS CUTTING MACHINES . . . GAS WELDING AND CUTTING APPARATUS, AND SUPPLIES . . . ARC WELDERS, ELECTRODES AND ACCESSORIES

You asked for it... HERE IT IS—

AO's New Metal Ful-Vue Safety GOGGLE!



HANDSOMER IN APPEARANCE • **STRONGER** IN STRUCTURE

With the introduction of the F1100 Metal Ful-Vue, AO's protection against the impact of flying particles reaches its highest development. Here in one goggle, with or without side shields, workers can obtain the peace of mind which comes from assured safety . . . the utmost in comfort over nose and temples . . . the very finest in EYE APPEAL PLUS EYE PROTECTION!

QUICK FACTS

NEW EYEWIRE — A major contribution to *looks with strength.* Outer edges are square instead of round with a deep groove to hold lenses securely in place. Beaded engraving adds a distinctive touch. The lightweight eyewire is strong and durable.

NEW RUGGED ENDPIECE—Streamlined . . . with a wide bearing surface at hinge which minimizes temple drop. Screw heads are countersunk and flush with endpieces for added good looks, non-sagging security.

NEW LIGHTWEIGHT TEMPLE—Oval temples instead of round for greater comfort and attractiveness. Easily adjusted, perspiration proof. Insulated semi or half tubing is another appearance improver and will outlast life of the temple. Tubing will not come off and it can't be discolored by dirt or grease. Both the temple and endpiece screws are AO patented "Ever-tite" construction . . . they keep tight in service yet remove quickly when replacing lenses.

IMPROVED GUARD ARMS AND BRIDGE — Guard Arms are newly shaped — longer with more opening for added ease of adjustment. The bridge is double braced with four contact joints — a feature found only in AO Ful-Vue spectacle goggles.

NEW SIDE SHIELD CONSTRUCTION — A real time saver . . . new one-piece binder and eyewire construction *eliminates necessity of inserting the screen before inserting lenses!* Replacement of lenses can now be made without any interference with or from the side shield.

For these and many other reasons, be sure to see the new F1100. YOUR NEAREST AO SAFETY REPRESENTATIVE CAN SUPPLY YOU.

American Optical COMPANY
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

NOW

easier welding
smoother deposits
same high wear resistance

THE NEW TUBE STOODITE

(for oxy-acetylene application only)

Here's a new fabricated rod for oxy-acetylene application which possesses marked welding ease. Its exceptional fluidity insures smooth, even deposits and its wear-resistance is equal in every way to the long-familiar cast Stoodite.

High fluidity with resulting low surface ripple adapts TUBE STOODITE to many applications: It minimizes subsequent machining when perfect surfaces are required. It can be more easily deposited in layers as thin as 1/16". Because of its fluidity, however, TUBE STOODITE is not recommended for build-ups.

You'll find TUBE STOODITE economy two-fold. It not only costs less, but also goes farther. Try TUBE STOODITE on your next job—it may simplify application besides cutting costs.

PROPERTIES

High Abrasion resistance
Resists galling and pitting
Good impact strength
Moderate corrosion resistance
Excellent weldability by oxy-acetylene method
Scours readily
Melting point 2275° F.
Specific gravity 7.5
Tensile strength 60,000 PSI
Rockwell C hardness 58-61

Typical uses for **TUBE STOODITE**

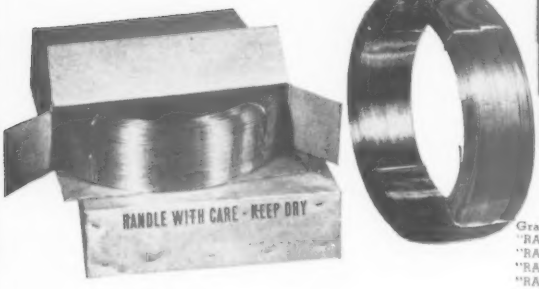
BRICK	*Brick Dies*
	Trim Dies
CEMENT	*Fan Blades*
POWER PLANTS	*Ash Conveyor Pins*
	Ash Conveyor Links
STEEL	*Pulverizer Hammers*
	Small Mill Guides
	Tube Mill Guides
AGRICULTURE	*Edged Implements*

STOODY COMPANY

11941 EAST SLAUSON AVENUE, WHITTIER, CALIFORNIA

A superior PRODUCT AT A competitive PRICE!

Wire in special thread-wound coils for submerged arc welding



Grades Regularly in Stock
"RACO" Mild Steel
"RACO" High Tensile
"RACO" High Mang
"RACO" High Mang-Moly
Furnished in all standard size thread-wound coils.

YOU profit by these RACO extras: Rigidly inspected high quality steel. Beautiful bright copper coating. All coils uniformly thread-wound and uniform in weight, width, inside and outside diameters to fit your reels. Thread-winding and prebent controlled curvature eliminates unwinding entanglements, waves, kinks. Assures deposition only in welding vee. Assures uninterrupted production.

Wire is drawn, copper coated, and mechanically thread-wound in one continuous operation immediately preceding shipment, on machines specially developed by us.

RACO coils are packed and sealed in heavy cartons, and palletized to prevent damage in transit, improper stacking or torn wrappers which result in rust and dirt. Coils are not distorted out of shape by rough handling. Steel-strapped palletized unit-shipments prevent mixing with other consignments at transfer terminals while en route; avoid filing of claims, etc. Fifty-six 25-pound coils, twenty-eight 75-pound coils, eight 150-pound coils per unit pallet at no extra cost to you.

Our special packing and shipping methods reduce your handling, disbursement, and storekeeping costs. Save storage space. Provide easy identification as to type and diameter of wire. Our superior quality and coiling assures superior welds and reduces cost per pound of deposited metal.

The **REID-AVERY COMPANY**
INCORPORATED
DUNDALK BALTIMORE 22 MARYLAND

It is the sales policy of The Reid-Avery Company, Inc., to market our products exclusively through distributors and agents.

Members of THE AMERICAN WELDING SOCIETY *and* THE NATIONAL WELDING SUPPLY ASSOCIATION

NEW INSPECTION METHOD

These four simple steps enable anyone to determine the location, extent, and nature of surface flaws or discontinuities in any metal.

Four Simple Steps for Easy, Economical Quality Control & Preventive Maintenance

The Dy-Chek inspection process involves the use of three special liquid compounds, non-corrosive and easily applied by brush, spray, or dipping. STEP 1—Clean surface with Dy-Chek Cleaner; STEP 2—apply red Dye Penetrant; STEP 3—remove excess Penetrant with Cleaner; STEP 4—apply white Developer ...brilliant red indications appear quickly if flaws are present.

Requires no electricity, lights, or special installations

The *only* requirements for Dy-Chek inspection are the three liquids, and simple equipment — such as brushes, sprays, or dip tanks — for applying the liquids.

Dy√Chek Inspection Can Be Used Anywhere!

Complete portability takes rigid inspection into the field for use by anyone without special training. Dy-Chek's low cost extends precise inspection to even the smallest companies. Ample supplies for inspecting large areas of metallic surface can easily be carried to any location. On the other hand, the simplicity of the process lends itself equally well to installation in a plant for production-line inspection.

SOLD DIRECT

dy√chek COMPANY

division of Northrop Aircraft, Inc.

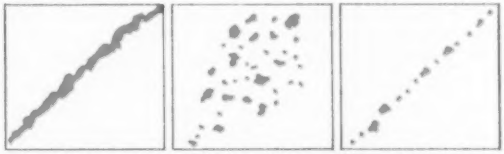
1509 EAST BROADWAY HAWTHORNE, CALIFORNIA

dy√chek —the dye penetrant inspection method

Revolutionary DY√CHEK TRADE-MARK Process Quickly Inspects Any Metal For Flaws

DY-CHEK, THE DYE PENETRANT METHOD OF INSPECTION* permits *anyone anywhere* quickly and conveniently to inspect *any* metal for flaws or discontinuities having surface openings. Castings, forgings, machined parts, plate, sheet, tubing, weldments ... aluminum and its alloys, cobalt, copper and its alloys, iron and its alloys, magnesium, nickel and its alloys, etc. ... magnetic and non-magnetic ... all can be surface inspected by the Dy-Chek process. *The surface need not be smooth.* Dy-Chek is a proven economical process developed by Northrop Aircraft Research, and is *already widely used in many industries.*

*Pat. Pend.



Positive Dy√Chek Indications Clearly Reveal Flaws

Dy-Chek inspection reveals both the nature and extent of surface discontinuities. A Red Line indicates a crack, cold shut, or similar opening; Red Dots indicate pits or porosity; a Series of Red Dots in a Line indicates a tight crack or cold shut, or a partially welded lap. The extent of the flaw *on and beneath the surface* is easily estimated by the width of the Dy-Chek indication.

SEND TODAY for COMPLETE INFORMATION

The simple, economical Dy-Chek process is available immediately for manufacturing inspection, receiving inspection, and preventive maintenance. Write today for complete details on how to simplify *your* inspection problems.

Dy√Chek Company
1509 East Broadway, Hawthorne, California

Send by return mail complete details on the Dy-Chek Dye Penetrant Method of inspection for any metal.

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

$125 and 7 weeks saved, thanks to NI-ROD repair of cast iron speed reducer

When a mishap all but destroyed a vital coil-vat speed reducer, maintenance men of the M & R Dietetic Laboratories were faced with a serious problem.

A new speed reducer cost 135 dollars and would take 8 weeks to be delivered. Repairing the unit would require only a week, but the damage was so extensive that success seemed doubtful. Yet, there was so much to be gained that they decided to take the gamble.

The shattered speed reducer was sent to M & R's welding shop, where . . . using Ni-Rod® electrodes . . . their welding technicians succeeded in assembling the broken pieces.

The cost of the repair, including labor, was only 10 dollars, and the time required was 1 week. *This represented a net saving of 125 dollars and 7 weeks down time. A highly profitable operation, indeed!*

Experiences such as this . . . of time and money saved in welding cast iron with Ni-Rod electrodes . . . are daily occurrences at thousands of welding shops throughout the nation. The reason for Ni-Rod's popularity with these experienced welders is *dependability*. With Ni-Rod electrodes you get quick, sound, machinable welds in all grades of cast iron . . . usually without preheating or postheating. Ni-Rod works well in all positions; can be used with either AC or DC current.

The best way to find out about Ni-Rod's many advantages is to try it. Order a package today and discover for yourself why *4 out of 5 shops* re-order Ni-Rod, once they have tried it.

Your nearest INCO distributor stocks Ni-Rod in 3/32", 1/8", 5/32", and 3/16" diameters.

For welds you've never been able to make before . . . in high-phosphorous irons; heavy sections—

NI-ROD "55"

Coil-vat speed reducer repaired with Ni-Rod at M & R Dietetic Laboratories, Columbus, Ohio.

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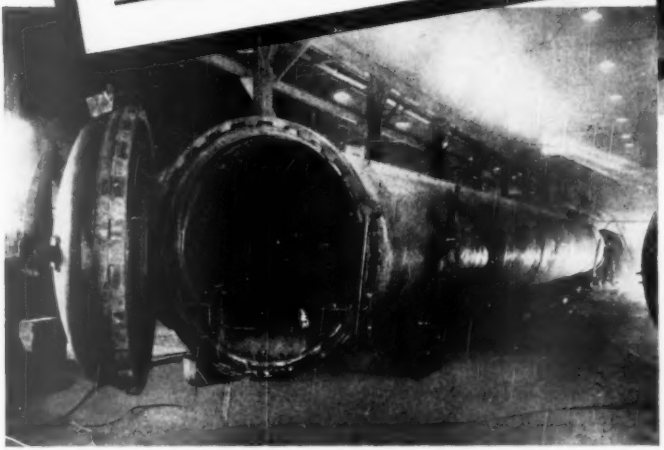
Production Up 50%
Labor Costs Down 50%
OUR CLAIM . . .
PROVEN BY OUR CUSTOMERS



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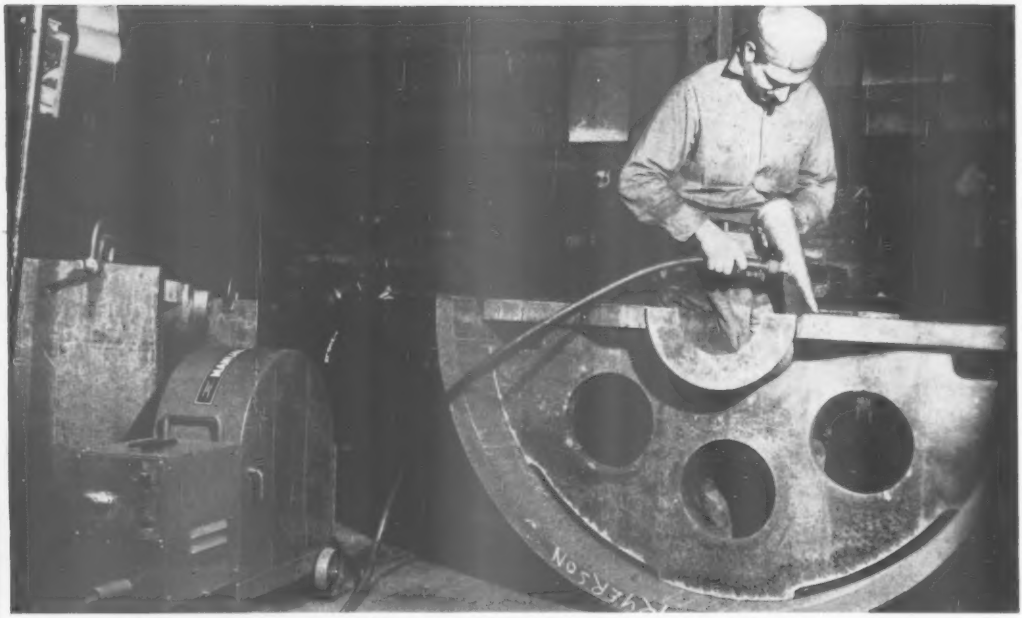

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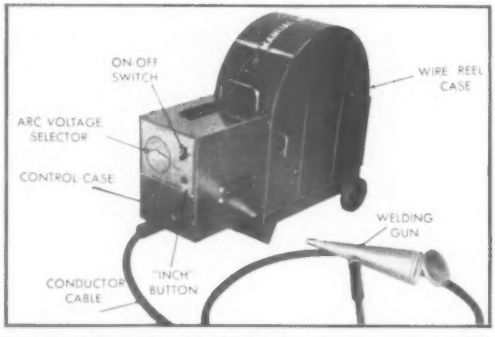

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ESTABLISHED 1916 SEPTEMBER, 1950

Welding Is Ready

VERY LITTLE of our foreign policy has made sense during the past five years, so it is scarcely surprising that we have a mess on our hands. It starts out in Korea, and we can only hope that it will end there.

Hindsight is always better than foresight. It is understandable that some of the eager beavers in Washington should lack the ability to guess the future, but it is not so understandable that they should also prove unable to learn from the past. Confused thinking, policy changing in the middle of the stream and utter disregard of the principles that have brought America to greatness have characterized the actions of our postwar political leaders. Now the inept bungling of those in high places has led us unprepared into another costly conflict.

No matter what the future may bring, all Americans can thank God that we have welding and welding know-how. Working together, these two factors contributed greatly to the winning of World War II and will prove equally as important today.

The Honorable Karl R. Bendetsen, Assistant Secretary of War, recently paid high tribute to the value of welding:

"World War II might and probably would have lasted many years longer, with enormously greater suffering and loss of human life, if it had not been for this country's phenomenal adjustment in war production made possible by welding."

Welding was ready then, and it's ready now.

While it is neither true nor proper to say that welding won World War II, it's not out of order to point out that welding certainly contributed its share. The welding processes played an extremely vital role in the late conflict. Without welding, the tide could not have been turned in time to save our Allies (including one nation which is anything but an Ally today). Without welding, Stalin would probably be dead and Hitler the master of Russia. The Russians are very grateful to welding. So grateful that they claim they invented it.

In the shipbuilding industry, welding worked miracles. Ships of welded construction were completed in one-fifth the time that was required to build riveted ships of similar size in World War I. It was only through welding that we could build the vast number of Liberty and Victory ships necessary.

The ships built by welding brought enormous quantities of war materials to Egypt, to England and to Russia. Hitler's divisions, which had romped over Europe and northern Africa almost unchecked, were stopped in their tracks. Then the Nazi legions began to move the other way.

Military tanks were once death traps to their crews because of flying rivets inside. Welding turned these juggernauts of destruction into effective weapons of war. Welding made possible the great land battleships of today. Other vehicles than tanks—jeeps, half-tracs, ducks, alligators, weasels—were also turned out by welding. So were LST's and other varieties of landing craft.

Welding increased the ruggedness and durability of the guns and cannons we used to hold off the enemy and deliver our own furious assaults.

Welding made possible the assembly-line production of the airplane. American fighters and bombers were superior to those of the enemy because they could carry greater loads at higher speeds. That was because we had learned how to weld alloy steels and aluminum alloys that would save weight without any loss of strength.

The full story of how welding was used in our atomic-energy plants cannot be told, but it is no secret that welding contributed greatly to the production of the atomic bomb. It is the fervent hope of every humane American that we will never again have to use this terrible weapon. Still, the world being what it is, it is nice to know that we do have it. On the peaceful side, the knowledge being obtained from our intensified nuclear studies has greatly advanced medical and industrial research.

Yes, welding was ready for the last war, and it was ready for the short-lived peace that followed it. And welding is ready now.

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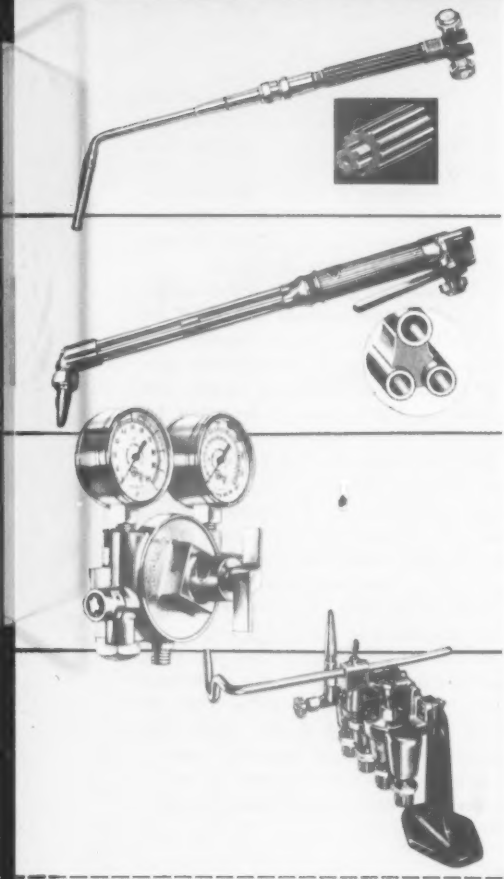

1 Rugged, performance-proved GX Welding Torch

Typical of REGO quality is this widely preferred Welding Torch. Stronger than steel, lighter than brass, the unique GX handle has no tubes, screws or soldered joints. Stainless steel head further guarantees long life. Four handle lengths and a broad variety of free-flow mixers and tips fit the GX to any welding job, regardless of size.

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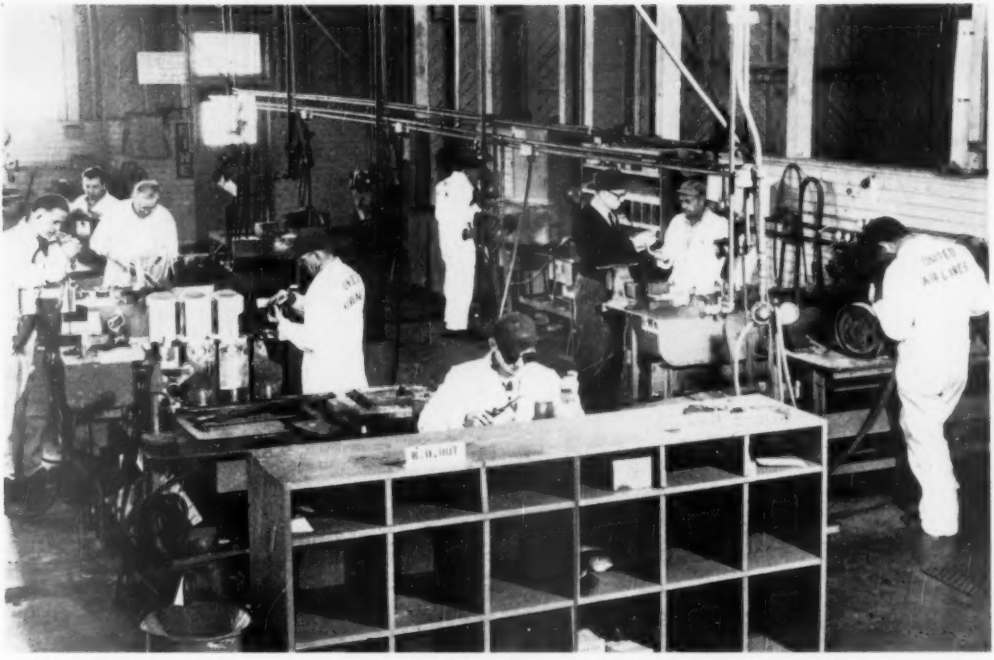


OXYACETYLENE WELDING SHOP at United Air Lines' maintenance base, South San Francisco, plays its part in . . .

Keeping Them in the Air

It takes a lot to keep planes flying, and it takes many sorts of welding jobs that you probably wouldn't think of. You know engines have to be regularly overhauled, but do you know that such parts as water tanks and gasoline tanks also require maintenance?

BY W. P. HOARE
General Manager of Maintenance, United Air Lines

BUSINESS is *too* good in the welding shop at United Air Lines' maintenance base in South San Francisco.

The shop has handled so many jobs so successfully—finding new welding applications every week—that maintenance men at the base take it for granted Supervisor Gordon Burnett and his crew can do ANYTHING.

Every once in a while, though, Burnett has to turn down a major repair on a structural member of a UAL plane, explaining politely that the Civil Aeronautics Administration wouldn't approve. The shop is strictly limited to welds covered in a voluminous file of overhaul and repair specifications worked out by UAL engineers under CAB regulations.

With few exceptions, however, the shop's staff can do just about anything. Burnett and George Casseday, foremen of the base's sheet-metal shop, believe they have about as skilled a crew as can be assembled. None of the 20 men in the shop have been with UAL less than five years—most of them are 10 or 20 year men.

Exceptional skill is essential. In an aircraft welding shop, 90% of the work is done on sheet metals of from ⅛ to 0.020 in. thick.

The UAL shop was established about two years ago when the company moved its major overhaul facilities to a new base near San Francisco International Airport. The shop makes use of inert-arc, metal-arc and oxyacetylene welding units. One of its two inert-arc units is mounted on a cart so it can be moved around the welding shop or hauled over to the heat-treating furnace in the metal-working shop. The 20 oxyacetylene torches are served by a centrally located manifold.

UAL is especially enthusiastic about the advantages of inert-arc welding in aircraft maintenance. "A good many parts we formerly considered impractical to join by oxyacetylene or metal-arc welding are now handled as part of routine repair," Burnett said. "The process also gives sounder welds, with less porosity, and cuts down on rejects and rewelding."

Stainless Water Tanks

A recent application of the inert-arc process was made in the construction of 20-gal and 30-gal water

New water tanks fabricated. . . .

1—WELDOR PREPARES to tack weld panels of stainless water tanks, using inert-arc process with argon. Note how flanges are clamped in place

2—FLANGES MELT DOWN when the seams are made. The weldor is adding a fitting to the nearly completed tank, used to replace an aluminum tank

tanks for the air lines' DC-6's. UAL had had a high replacement rate on the lightweight aluminum tanks originally built for the planes. The tanks were strained by the pressure of the water systems—up to 90 psi in some of the cities in which they were filled—and were also subject to considerable corrosion. It was decided to replace them with water tanks built of stainless steel.

In designing and building the replacement tanks, several problems had to be considered. The new tanks had to be stronger and more corrosion resistant than those they replaced but without adding weight. Also, their interiors had to be clean and free from flux. The inert-arc process was held ideal for the job as it can form a strong, clean weld on thin-gauge stainless.

UAL engineers specified 0.020-in. 18-8 steel for the tanks. First, the edges of the tank panels were flanged; the flanges permitted the thin metal to be joined without distortion or warping. Baffle plates were tacked to the flanged edges with a spot welder, borrowed from the sheet-metal shop. The flanges had the added merit of melting down to form part of the filler metal at the time the inert-arc welding was done.

The weldor in Fig. 1 is preparing to tack weld the panels together with the inert-arc torch. Clamps hold the flanges in place. In Fig. 2, the weldor is welding on a fixture.

Beverage Containers

Inert-arc welding was again a "natural" when the welding shop was called upon to make some 2-gal stainless-steel containers to hold hot beverages. The same 0.020-in. 18-8 sheet stock was specified. A deep-drawn stamping would have turned out the container in one piece, but, as only a small number of containers were required, the cost of a die to draw that deep was out of the question. As a compromise, the bottoms of the containers were stamped and also the rounded corners for the top. One small stamping was quartered to do the latter job.

In Fig. 3, the body of the beverage container is being placed in the jig so that the stamped bottom may be welded on. This picture also shows the rounded corners welded to the container top (part nearest to the jig).

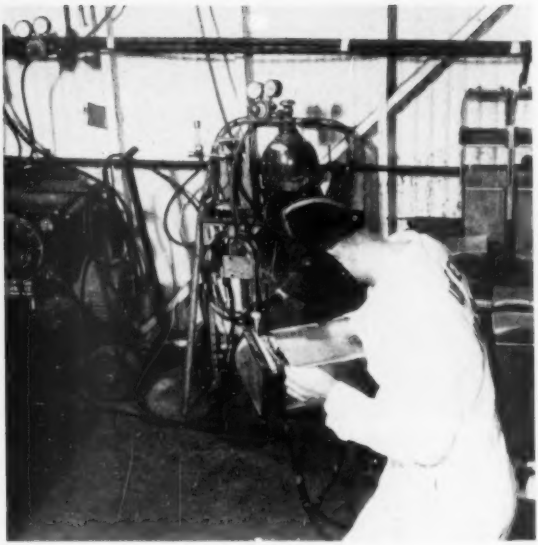
The jig is fitted with a copper back-up plate to insure complete weld penetration and a smooth interior. "Drips" would be as undesirable as incomplete penetration in a container to hold liquids for drinking purposes. The copper back-up plate serves to keep the interior smooth and easily cleanable.

The welding of the bottom to the container has been started in Fig. 4. The filler rod is of 18-8 stainless—the same alloy as the parent metal.

Maintenance Routine

A good proportion of the welding crew's routine is maintenance inspection. For instance, always under way is the inspection and repair of DC-3 exhaust collector rings, set up on a specially built jig. During the periodic major overhaul of UAL planes, the stainless-steel rings are removed, cleaned and sandblasted and sent to the welding shop to be

3—WELDOR PUTS 2-gal beverage container on jig for welding. Note the copper back-up plate



4—STAMPED BOTTOM is welded to stainless container by inert-arc process, saving expense of a die for deep drawing

trued up and examined for any wear. The rings must be checked minutely for any cracks that may have appeared—the weldors know the extreme importance of catching every break in an aircraft part, no matter how tiny. If considerable wear shows, arms of the collector ring may be trimmed an inch or so and a new band welded on.

All three types of welding may be used on this maintenance job. If a minor break is so placed that flux can easily be removed, oxyacetylene welding may be used. For more extensive repairs, inert-arc welding is preferred; however, metal-arc is also frequently used.

Inspection and Testing

Visual inspection of worn parts of stainless steel is supplemented in doubtful cases by heating. The part is heated next to the suspected crack —a color change will show up any breaks. The fluorescent-penetrant process is used extensively in the inspection of aluminum and magnesium parts. Similarly, the magnetic-particle process is used for steel parts. Occasionally, a good-sized casting is sent out of the base for magnetic-particle inspection.

Destructive tests of completed welds are by standard methods. A sample or samples are cut from the weld for bend testing or etching. There is no tensile-strength testing equipment at the base, but such facilities are easily available in the San Francisco area.

Gas Tank Overhaul

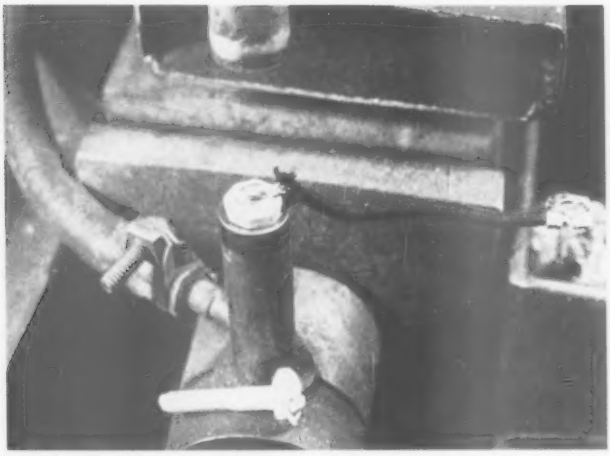
Another routine major overhaul job is the inspection and rebuilding of 100-gal aluminum gas tanks. One tank takes from 60 to 80 man-hours. The shop handles about six tanks every month. First step is to cut out the old bottoms to permit the tank to be cleaned and inspected for corrosion. New bottoms, scalloped around the edges for greater weld strength, are then welded in place by the oxyacetylene torch and a $\frac{1}{8}$-in. silicon-aluminum filler rod. Immediately after welding, the aluminum flux is removed—this calls for the tank to be washed with nitric acid to make sure that every flux particle is out.

Zinc chromate solution is introduced into the rebuilt tank under pressure; its purpose is to guard against corrosion and show up any leaks. The tank is rotated four times over a period of about eight hours so that the chromate may thoroughly coat each side of the tank.

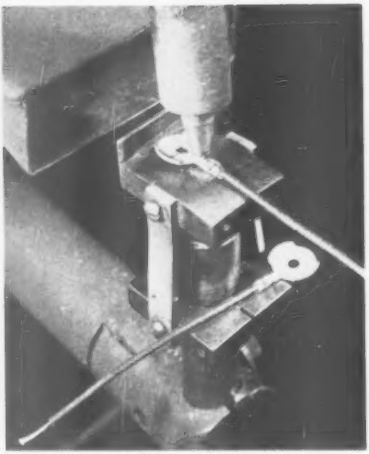
The original tanks were made of 0.040-in., 3S0 aluminum, but the bottom replacements are made of 0.050-in. gauge. The framework of the tanks is of extruded aluminum bulb angle, and the walls are riveted to this with 3S0 rivets. Each rivet has the head welded over.

Ordinarily, only the bottoms of the tanks suffer from corrosion, so other parts are replaced only when they have been damaged in some way. To lessen corrosion damage in the bottoms, the replacements are beaded. This allows the moisture that collects in the tanks to run down into sumps for draining.

About a fifth of the shop's time is spent on the manufacture of repair parts. Its crew, for instance, builds all replacements for DC-3 exhaust systems, including the exhaust rings, boilers, tail pipe, etc. Supervisor Burnett estimates that the shop builds about 90% of the sheet-metal replacement parts for the air lines' DC-3's. In addition, of course, many other parts are required for the company's fleets of DC-4's, DC-6's and Boeing Stratocruiser airplanes.



1—SPOT WELDER hot upsets copper leads into a zinc-plated terminal stud. Brass is formed when the copper alloys with the zinc



2—TANGS of a zinc-plated steel clip are welded to copper wire, then crimped

Resistance Welding to Replace

BY RUSSELL F. SMITH

Process Dept., Delco-Remy Div., GMC, Anderson, Ind.

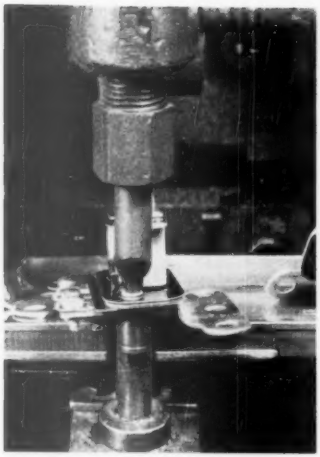
TREND for the past few years has been towards more use of resistance welding to replace riveting, brazing and soldering. One place where resistance welding has helped us considerably at Delco-Remy is in replacing soldered connections. Our electrical products require connections that posses good electrical conductivity and mechanical strength. Clips, studs and flat plate used to have copper leads soldered to them, but we have found that welded connections have higher electrical conductivity and greater mechanical strength. They are also made more economically. Wherever possible and practicable, we are now replacing soldered joints and are designing new products so the connections can be properly welded.

Two Types of Joints

These connections are often made by welding a copper lead directly to a zinc-plated steel clip, stud or flat plate: for example, the end washer to a coil assembly. Heating the zinc plate and the copper wire together under pressure forms a brass alloy.

When copper or copper alloys are

Soldered	Welded
1 A soldered connection is not mechanically strong and will not withstand a constant load in tension nor severe vibration.	**1** A welded connection is superior mechanically; will withstand a constant load in tension within the design limits.
2 In order to obtain sufficient strength, a mechanical fastening such as folding, crimping or staking is necessary in addition to soldering.	**2** Fastenings are not necessary to obtain sufficient joint strength in welding, but are used in some cases when multiple connections are necessary.
3 A soldered connection is subject to creep and cracking under very small sustained loads. Fatigue gradually weakens it.	**3** A welded connection will not creep or crack under small sustained loads. There is no weakening of the connection.
4 Electrical characteristics may become progressively poorer because of aging, cracks, creeping or corrosion.	**4** Electrical characteristics are only slightly affected by aging. Electrical conductivity is not lost with age.
5 Flux residues may cause progressive corrosion, especially if residue was not completely removed when a corrosive flux was used.	**5** Flux is not used in making a welded connection. Hence the problem of progressive corrosion due to flux residues does not arise.



3—COPPER LEAD is welded to a zinc-plated terminal, saving labor

Soldering

joined together, we introduce an intermediary non-ferrous alloy between the surfaces. This alloy has a fairly high electrical resistance, which localizes the heating at the joint. Both of these types of connections are classed as welds under the definition of a weld by the American Welding Society:

"*Definition of a Weld*—a localized coalescence of metal wherein coalescence is produced by heating to suitable temperatures, with or without the application of pressure, and with or without the use of filler metal. The filler metal either has a melting point approximately the same as the base metals or has a melting point below that of the base metals but above 300 F."

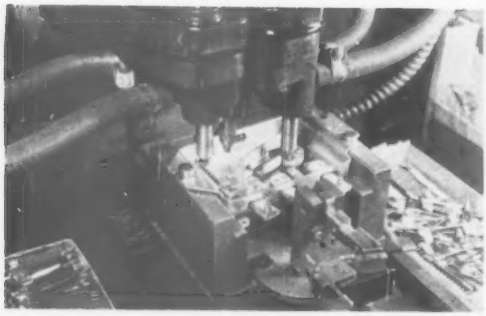
Now let's see how brazing is defined:

"A group of welding processes wherein coalescence is produced by heating to suitable temperature above 300 F and by using a non-ferrous filler metal having a melting point below that of the base metals. The filler metal is distributed between the closely fitted surfaces of the joint by capillary attraction."

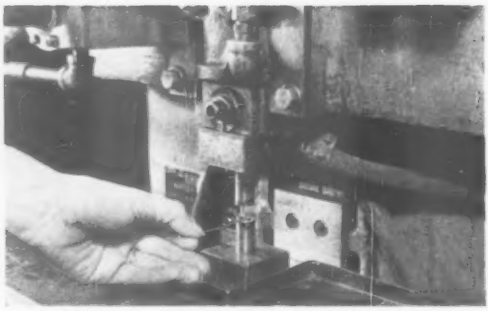
The copper-to-steel connections definitely fall in the weld classification. The non-ferrous alloy that is used to assist in making a copper or copper alloy weld is forced into position: no capillary attraction occurs as during a braze. Therefore, this type of joint must also be called a weld.

The parallel columns of this and the opposite page make a direct comparison of a welded connection and a similar soldered connection. The most outstanding advantage to be realized when replacing soldering with welding is the reduction in labor cost through higher production. This saving may be 30 to 50% and is a determining factor in deciding whether or not a soldered connection should be replaced by welding.

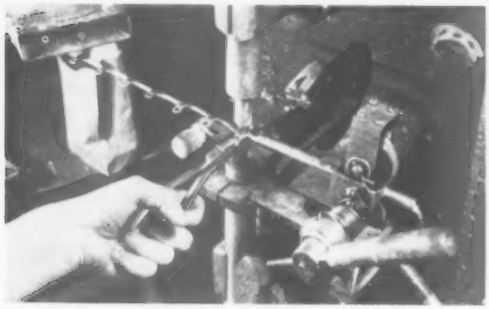
Soldered	Welded
6 Flux is costly; its application requires considerable labor for mixing and applying. Flux cleaning is often needed.	**6** Again, flux not used. Welding saves the cost of mixing and applying flux, and the labor needed for flux cleaning.
7 Copper tips for soldering are replaced as often as every 15 minutes. Tips have to be repointed and retinned by skilled labor.	**7** Electrodes last considerably longer than soldering tips. One set of electrode tips will make several thousand welds before redressing is necessary.
8 An operator can waste time by holding the parts to the soldering tip longer than necessary. It is difficult to determine the length of time needed. Cycle is not easily controllable.	**8** A resistance welder can use a sequence weld timer to control operation to a fraction of a second. It's impossible for an operator to waste time once the cycle has been started.
9 Overheating may char insulation of electrical parts.	**9** Insulation is not subject to burning or charring.
10 On parallel operations, operator's time may easily vary under the same conditions.	**10** Sequence timer makes it impossible for time to vary on parallel operations.
11 Training of operators for soft soldering may require as long as three months. This is a long and expensive process.	**11** There is no training period. Operators can become efficient in operating a resistance welder within a few hours.
12 Soldering operators are general classification, and it is difficult to hold them. Because of new men, a soldering operation requires considerable supervision.	**12** Resistance welder operators are also general classification. However, the changing of operators does not tend to reduce production since efficiency is easily attained.
13 Most solders contain 20 to 60% tin, costing $1.08 per lb. The amount of tin used per connection is hard to control. A welded connection does not require tin.	**13** The cost of the intermediary alloy used for copper or copper-alloy welding is higher by the lb than tin, but the unit cost per connection is lower as less alloy by weight is used.



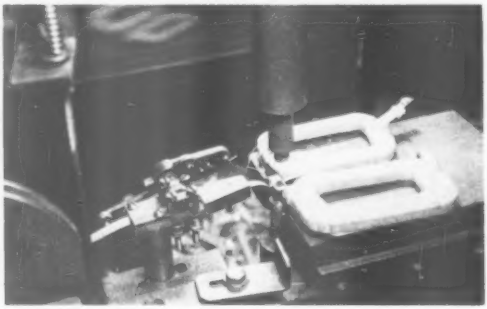
4—SERIES WELDING produces two projection welds simultaneously of brass parts to zinc-plated steel



5—TIN PLATED brass clip is welded to a stranded copper wire. Both top and bottom tips are moly faced



6—BRAZING ALLOY helps join flat copper clips to stranded copper wire in a continuous production flow



7—JOINING TWO tinned copper sections. Ribbon of brazing alloy is fed in by an automatic feeder (left)

Of the illustrations, Fig. 1 shows the hot upsetting of copper leads into a zinc-plated terminal stud. Mechanical staking is combined with a joint of brass (formed by the alloying of the copper with the zinc plate). The joint has both mechanical strength and good electrical conductivity. Resistance welding reduced the cost of this type of connection by 40% because of (*a*) the increase in pieces per hour and (*b*) the elimination of solder and flux.

The tangs of a zinc-plated steel clip are welded to copper wire as shown in Fig. 2, using RWMA Class 2 electrodes. The weld is not heated sufficiently to cause tip pick-up. The insulation is crimped under the second set of tangs to give support to the wire, which is subject to vibration of fairly high amplitude. This clip-and-lead assembly was formerly soldered with an iron. Welding reduced the labor cost by 50%, to say nothing of the savings in the cost of solder and flux.

Figure 3 shows the welding of a copper lead to a zinc-plated terminal. The top electrode has been faced with molybdenum so the zinc pick-up will burn free instead of building up. The fixture is set at an angle to maintain the wire full size as it leaves the weld.

The connections in Figs. 2 and 3 form a combination weld and brass braze, using the brass formed between the zinc plate and the copper for conductivity and the weld to the steel to give added strength. In Figs. 4 and 5, the welds are made without depending on the formation of an intermediary alloy such as brass.

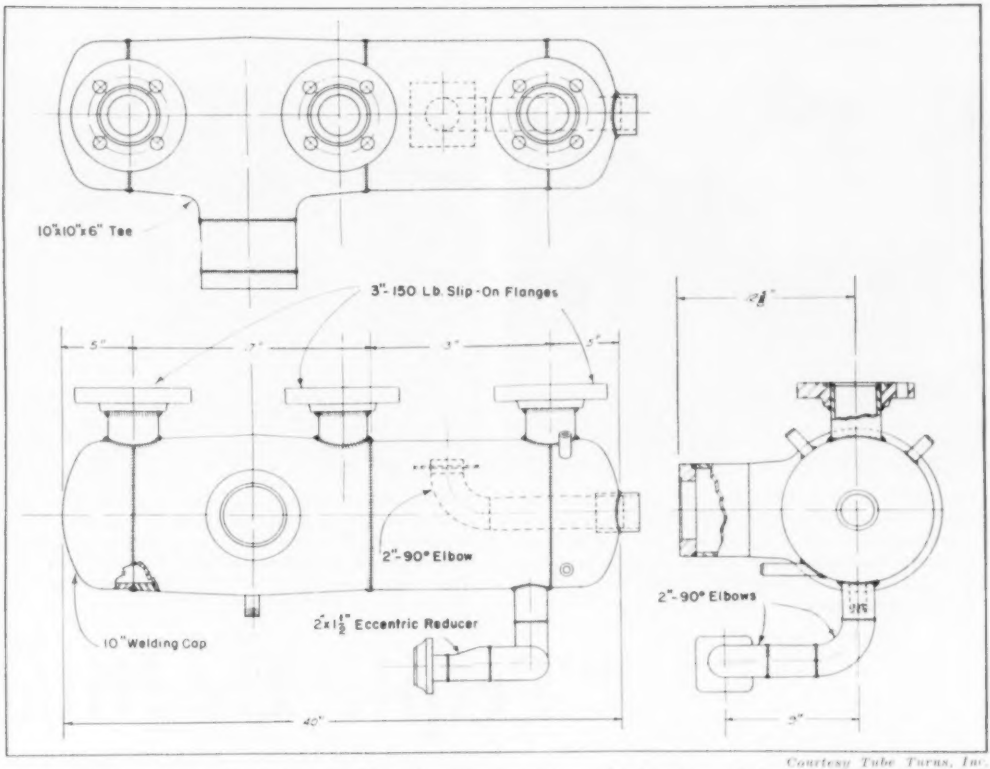
Figure 4 shows multiple welding of resistors to the base of a voltage regulator. Tungsten-tipped electrodes are used to produce two simultaneous projection welds of brass to zinc-plated steel.

A tin-plated brass clip is welded to a bare stranded copper wire, Fig. 5. Moly-faced tips are used at top and bottom.

Figures 6 and 7 are welds in which a low-cost brazing alloy is placed between the copper parts to localize the heating and produce fast, economical welding. Figure 6 pictures the welding of a flat bare-copper clip to stranded copper wire. The clips are put on at multiple lengths, and the wire is cut later. A small amount of brazing alloy penetrates the stranded wire and prevents the end of the lead from fraying when it's cut.

The welding of two tinned copper sections, using a ¼ by 0.003 in. ribbon of alloy, is shown in Fig. 7. The brazing alloy is fed automatically by the feeder at the left of the picture. Both upper and lower electrodes are moly-faced. Redesign of the connection for resistance welding saved labor, solder, flux and a considerable amount of the expensive tinned copper sections.

The saving in the cost of a material for joining by using a welded connection is generally 3c per hundred pieces for small connections, such as leads to clips, and 5c per hundred pieces for heavier connections. The cost of the intermediary alloy is higher than tin by the pound, but the unit cost per connection is lower than for solder as considerably less alloy by weight is used.



Courtesy Tube Turns, Inc.

PLAN VIEW, elevation and end view of a 10-in. diameter surge drum, fabricated to aid the processing of margarine

Vessel from Pipe Fittings

A tee and a short length of 10-in. pipe make the body of an ammonia surge drum. The tee has a wholly smooth contour to facilitate the action inside.

By T. B. JEFFERSON

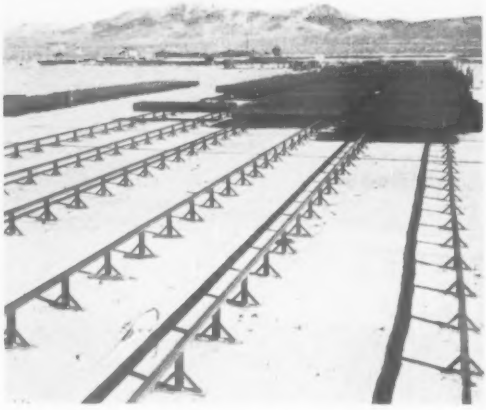
AN EXCELLENT example of what can be done with piping, welding fittings and flanges is provided by the smoothly functioning ammonia surge drum shown in the accompanying engineering drawings. This drum was tested to 300 psi and will operate at 150 psi in the processing of margarine.

This is really an example of how a pressure vessel might be fabricated from welding fittings and pipe. A 13-in. length of 10-in. pipe was welded to a 10 by 10 by 6 in. welding tee to form the body of this pressure vessel. The ends of the vessel were capped with 10-in. welding caps. Before it was welded in, one of these caps was specially prepared for the inlet by flame-cutting a hole and welding in place a short bushing. Into this bushing, there was fitted a unit made by welding a length of 2-in. pipe to a 2-in. 90-deg welding elbow and joining the elbow to a short length of pipe with a square flange (see elevation above). In addition, there was also welded to the same cap two ¾-in. nipples; these were in radial position 45 deg from center in each of the upper quadrants of the cap. A longer nipple was welded in a horizontal position near the bottom of the cap (see end view).

After the caps and the drum body had been joined, several openings had to be flame-cut to provide inlets and outlets. Three openings were cut on the upper side of the drum for three 3-in. nipples. Before they were welded to the drum, these nipples were prepared by welding to each of them a 150-lb slip-on welding flange. Holes were also flame-cut in the bottom of the drum. To one of these bottom holes, there was welded a 1-in. nipple, to the other hole an eccentric reducer unit. The latter had been previously prepared by joining two short 2-in. nipples to a 2-in. 90-deg welding ell and then welding another 2-in. ell to one of the nipples. The 2 by 1½ in. eccentric reducer and a flange were attached to the second ell.

The job was completed by welding a 6-in. nipple and flange to the 6-in. outlet of the 10 by 10 by 6 in. tee.

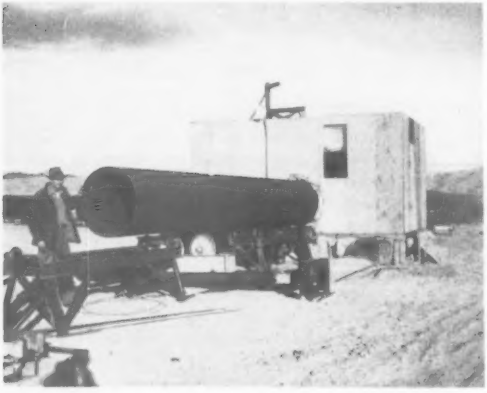
UNLOADING PIPE. The specially built spreader bar attachment on 20-ton fork lift hooks onto ends of top three lengths of pipe. Top pipe on the load is about 20 ft from the rails. Attachment is removed when top three pipes are lifted—rest of the 12-pipe load is within the fork lift's regulation reach.



"ROLL-DOWN" RAILS (they have a fall of 2 in. in every 100 ft) carry the pipe lengths down to the first welding station. Margin of operation between unloading and welding is 75 carloads or about 5½ miles of pipe. Plant turns out about two miles of triple-ended pipe a day, ranging in thickness from 5/16 to 7/16 in.

"Triple Ending"

Not content with a "double ending" plant (THE WELDING ENGINEER, April, 1950), Bechtel Corp. converted to "triple ending" to weld Super-Inch line.



SHED SHELTERS automatic welding machine and its operator from dust storms. Wind sweeping across desert flatlands occasionally has the same effect as a sand blast on unprotected cars and equipment. Pipe rolls from racks onto a conveyor, which delivers it to the submerged-arc welding head to complete the joint.

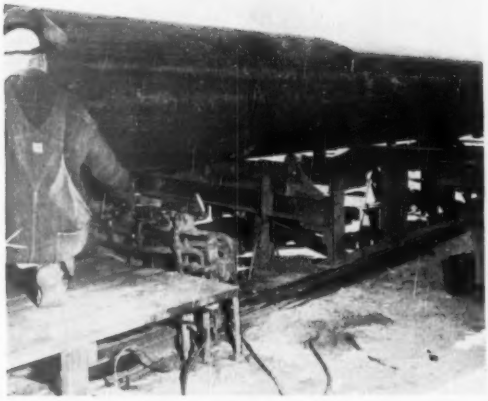
BY MARGARET RALSTON

BECHTEL CORPORATION'S "double ending" plant at Santa Clara, Calif., joined two 30-ft lengths of 34-in. pipe for the northern 80 miles of Pacific Gas & Electric Company's outsize gas pipe line. When Bechtel moved its operation down to the southern end of the line, near Needles, Calif., it moved into desert country that made trucking of even longer pipe sections feasible. So now the company's weldors are joining three pipes into 96-ft lengths that weigh some 7½ tons each.

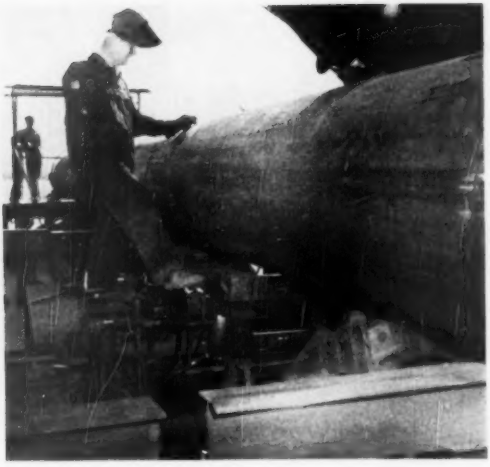
The enlarged operation pays off in two ways: (*a*) it puts two-thirds of the welding on the pipe line under controlled assembly-line conditions for consistent quality; (*b*) costs are cut by trimming the amount of welding required in the field.

Along with R. A. Conyes and H. C. Price, Bechtel holds a $63,000,000 contract for construction of the 506-mile California section of the line between Milpitas, Calif., and Topock, Ariz. El Paso Gas Co. is building another 1,100 miles of line of lesser diameter. Purpose of the project is to bring natural gas from Texas and New Mexico to the California border. Its total cost will be around $150,000,000.

The pipe lengths are fabricated in South San Francisco by Consolidated Western Steel Corp., a U. S. Steel subsidiary. They are shipped by rail—12 to a flatcar—to the welding plant, located at Barstow at the present writing.



ALIGNING PIPE on "fingertip control" hydraulic positioner developed by Beentel. Two pipe lengths can be aligned in 15 seconds. Jig moves one of lengths horizontally or vertically to place it for a stringer bead. An electrically driven "bug" is then sent inside the pipes to clamp them into position.

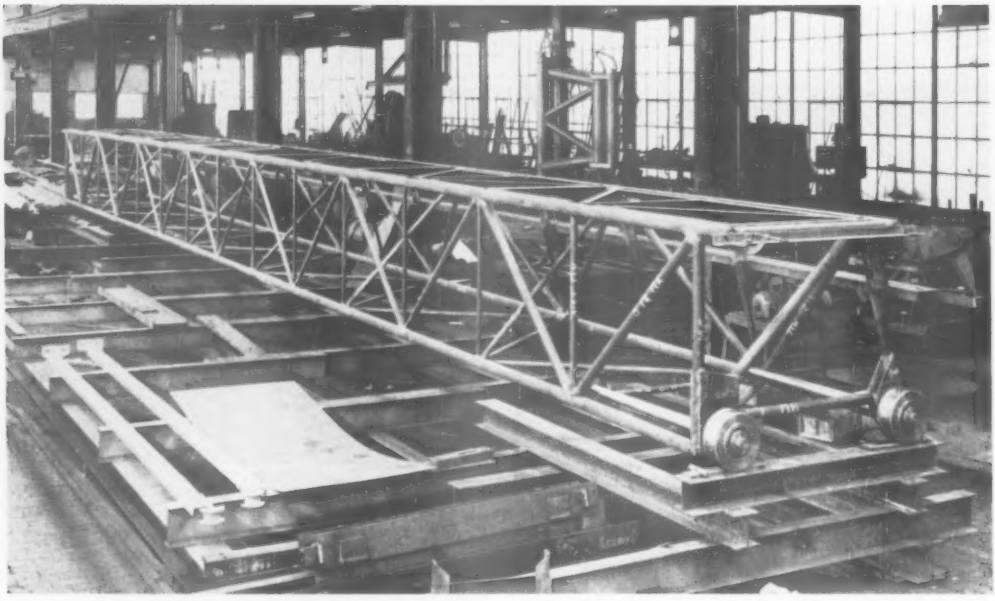


TWO WELDORS, working from either side, can handle about eight welds per hour. Another team welds third length. Air-lift ejector pushes manually joined pipe onto rails to go to next station, where two weldors, working simultaneously, lay second manual beads over the first stringer beads. Pipe is revolved by roller.

Pipe Line . . .

GAMMA-RAY INSPECTION. Picture is a phony: onlookers would be about 12 ft back if the stand really held a capsule of radium salt. About 10% of the welds are tested in this manner.

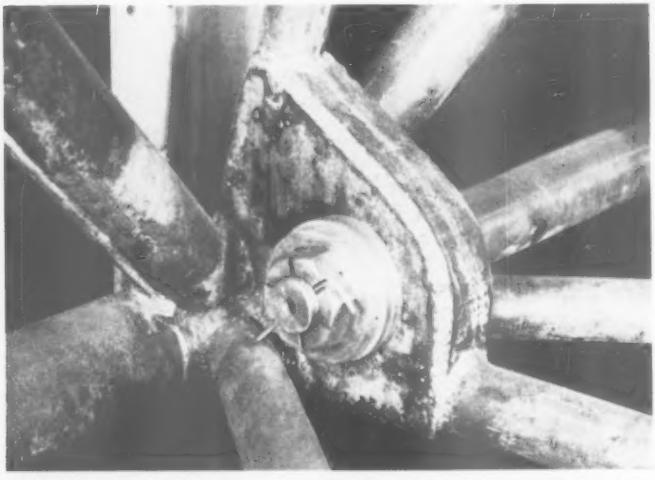
FORK LIFT moves up to load five "triple-ended" pipes onto a specially lengthened and strengthened truck. Trucker's quota is 10,000 ft a day. A small tractor is used to nudge the welded pipes over into the loading area.



WELDED FRAMEWORK under construction. Four main chord members (corners) are 2½-in. pipes spliced together

Build a Swimming

Corrosion-resistant wrought-iron piping made the framework of a 54-ft structure to start swimming races. Welding was the only practicable method of fabrication.



NINE MEMBERS come into a point—seven pipe members, the axle housing for an inside wheel and a plate gusset. Truly a neat problem in welding!

BY ALBERT BAVARIA

Welding Engineer at Philadelphia for The Lincoln Electric Co.

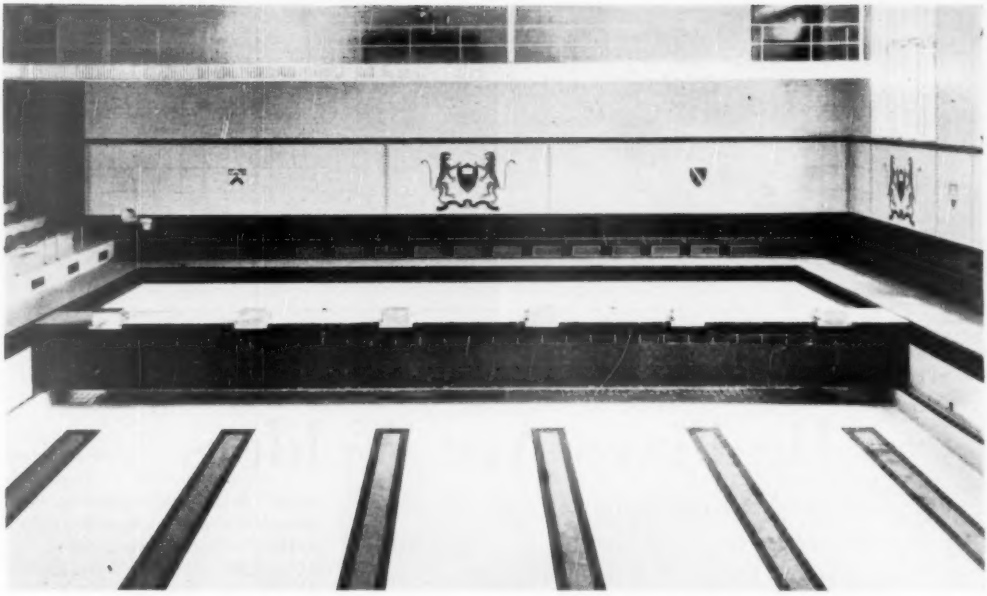
SPLASH! And they hit the pool at Princeton University. Swimming races now start from a welded bridge with a 54-ft span and a 4-ft depth: it's movable up and down the tank to vary the length of the racing course.

The structure has to be light to be readily movable when it's submerged and must, of course, resist corrosion. To satisfy these specifications was the task of its builder, the Industrial Engineering Works, of Trenton, N. J.

Look to Welding

A riveted structure of standard steel shapes would have been out of the question from the standpoint of both weight and cost. So—

Industrial Engineering designed and made a welded framework of wrought-iron pipe. The entire frame



BRIDGE INSTALLED in pool of Princeton University. It's moved up or down tank to vary length of racing course

Bridge for Princeton

of the structure is made of pipe. Plate gussets are used only for connections to axle bearings and as supports for a scum gutter framing. Stainless-steel pans, ⅛-in. thick, are fastened to angles welded to the top of the frame, to which 13-gage wire mesh is welded to form a bond for the tile deck.

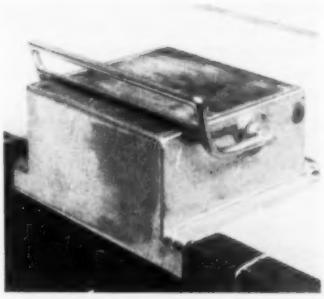
The four main 54-ft chord members are made up of two 20-ft lengths and one 14-ft length of 2½-in. wrought-iron pipe with a 0.203-in. wall thickness. To join these members, pieces of pipe of smaller diameter were inserted inside the chord members at the splices and plug welded; a 3/16-in. gap was left between chord members to permit fusion with the pipe insert. Each of these joints was then veed slightly and welded. The bottom chord splices were covered with a 3-in. pipe sleeve, welded in place.

The vertical, horizontal and diagonal members of the bridge frame were made of 2-in. pipe (0.154-in. wall), 1½-in. pipe (0.145-in. wall) and 1¼-in. pipe (0.140-in. wall); lengths ranged from four to seven feet.

Assembling Members

First, the two side trusses were assembled, tacked and welded. They were laid on their sides so that practically all welding could be done downhand and were clamped on a shop skid in the flat position to prevent distortion. The top, bottom and diagonal bracing were clamped in a normal upright position to the two side trusses. Vertical angle braces were welded to the shop skid to make a cradle to which the trusses could be clamped. Blocking of varying thickness under the bottom chord held the camber.

All but a few of the joints were welded in two passes, securing from 50 to 60% penetration into the thickness of the pipe wall. Amperage was increased from 125 to 150 for the second pass. An E-6010 electrode was used in ⅛-in. and 5/32-in. diameters. All joints were cleaned with a rotary wire brush. Total time needed from layout to final testing was approximately 400 hours.



STARTING STOOL on bridge was made from type 316 stainless steel

The structure is covered with water part of the time and at other times sits in an empty pool. Leaks in the pipes cannot be tolerated. Water inside the pipe would drain out and stain the tile floor with rust during the time the pool was empty. Hence the completed frame was tested with 90 psi air pressure to locate leaks. Any leaky joints found were rewelded, but few leaks appeared.

1—SCORED PISTON and gouged bearing from engine run without oil. Both came from the welder in Fig. 2

2—BATTERED welder brought in for rebuilding. Its engine was inoperative, and welder out of adjustment

He Fixes Arc Welders

Repair and rebuilding of engine-driven welders is the useful service offered by Harry Miller, distributor in the Chicago area. Miller's firm can fix anything from water in the gasoline tank to extensive damage by fire.

BY WILLIAM C. HENZLIK

OVER A 20-YEAR period, Harry Miller, Chicago welder distributor, has built up a business that helps out many a construction outfit, piping contractor or maintenance crew in the five counties around Chicago. Such welder owners usually have no welder specialist to take care of their machines.

A big reason for the success of Miller's enterprise is the rough life led by most engine-driven arc welders. More than any other type of welding equipment, they are subject to the whims of human treatment or mistreatment. In addition, working conditions are severe and storage facilities haphazard for a good share of the time.

ROUGH COUNTRY, ROUGH CARE

Pipe lines must be laid through swamps, over rocky terrain and through sandy stretches of open country. The going is hard on both men and machines. The amount of damage that can be done to a welder on such jobs must be seen to be appreciated.

Some welders sit outside, day and night, through rain, snow and blistering heat, for weeks and months on some jobs. To be sure, the side shields on the welder are usually lowered, but this only stops moisture from hitting directly on machine parts. Any moisture in the air, any dust or corrosive fumes are quite free to work on the otherwise exposed parts of the welder.

Welders come into the Miller shop covered with solidified concrete, battered from collisions, charred and scorched from fires and encrusted with rust from long exposure to the elements. Yet—a tribute to the inherent ruggedness of welders—almost every one of them can be put into "good as new" shape.

The engines on some welders are severely damaged, sometimes through sheer negligence. Fig. 1 shows a piston and main bearing. Note the scoring on the piston and the deep gouges in the bearing surface! Evidently the engine was run for some time without oil. The piston and bearing belong to the welder in Fig. 2, which came into the shop with engine inoperative and glasses on gages broken.

FIRE DAMAGE

Scorched and burned welders provide tough repair problems for Miller, and they come in often enough to keep him alert to the damage that can be caused. Carelessness, a word often repeated in any maintenance story, is most prevalent reason for welder fires.

Spilled gasoline from the fuel tank causes most welder fires, according to Miller. Excess oil or grease on the frame, axles, etc., can cause trouble also because the static electricity generated when the welder is on the highway can ignite this inflammable substance. Several people in the Chicago area have felt the unpleasant excitement of looking behind their tow trucks to see flames enveloping their welders.

If you spill gasoline or oil on a welder, take the time to wipe it off. Five minutes spent this way will reduce the fire hazard to practically zero, says Miller. Some weldors apparently, would rather let the oil accumulate and pay (or let employers pay) a big rebuilding bill.

Other than outright destruction by crushing or by an explosion, fire is about the most serious mishap that can befall a welder. Copper in the commutator, the conductors and the wiring usually melts or fuses into an uneven mass. Insulation burns or deteriorates to the point of uselessness. Motor frames are bent or twisted out of line.

If engine damage is too extensive, a "short" block from the factory replaces it. This block includes all main components but no accessories. It generally costs about half as much as a new engine.

The most severely damaged welder Miller or his repairman ever saw

3—HARRY MILLER watches repairman Harley May as he undercuts the mica on a damaged welder commutator

4—DAMAGED EXCITER coils from welder. Wires are broken, insulation torn off. At left is a new coil

was a 300-amp motor-driven model damaged in a machine shop fire. The blaze completely destroyed the building. The welder, stationed on the first floor near some heavy turret lathes, fell through the floor and crashed into the basement. To add to the punishment it received, one of the heavy lathes also fell through the burning floor and landed on top of the welder.

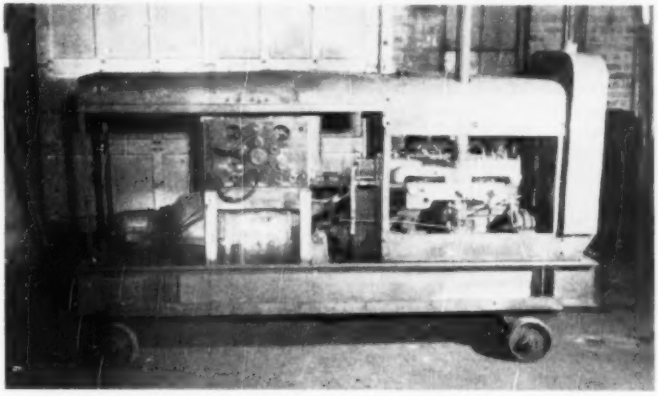
The burned, crushed remains were brought into Miller's shop several days later. He looked the carcass over. "Extremely doubtful," was his verdict. However, he took it in as a trade-in on a new welder, replaced the control panels and repaired the motor starter switch. At the first attempt, the welder started.

Burned Welder Resold

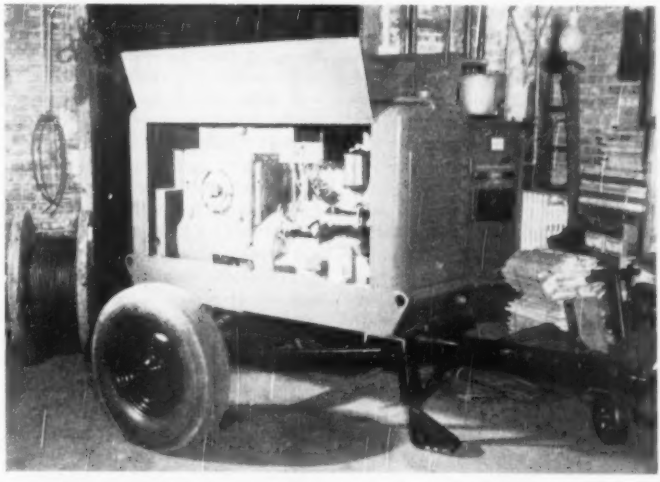
For some months, this renovated machine was used as a rental by several customers. One satisfied renter finally bought it.

In contrast, some welder ailments are quite minor. Miller commonly prescribes for the old trouble of water in the gas tank. When a welder is used only at long intervals, most of the water in the air above the gasoline level has time to condense and foul up the gas. Dirt or other impurities in the gas line are other troubles he occasionally has to correct.

Broken meters, fuel indicators, operating handles, loose connections in the welder controls . . . these are everyday complaints from owners of welders. Many of these small jobs are taken care of at the owner's place of business.

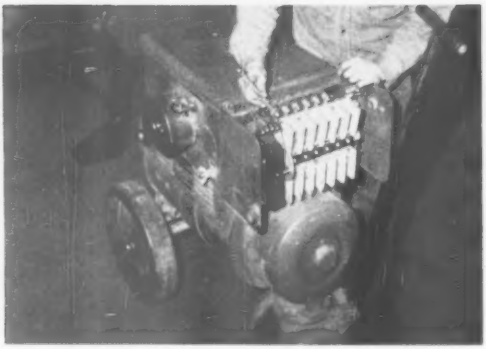


5—OLD WELDER brought into shop on trade-in. The inherent ruggedness of most arc welders permits them to run for many years at top efficiency



6—REBUILT WELDER looks like a new machine. The customer who brings in a damaged welder can take out a rebuilt as a trade without any waiting

7—CORROSION damage from sulphuric acid fumes. Repairman May will also look at electrical connections



8—ADJUSTING welder for power supply of different voltage—motor may operate on either 220 or 440 volts

Other troubles can come when welders are operated near concrete pouring or brick construction jobs. They sometimes become coated with a fine deposit of grit, dust or even liquid concrete. What that sort of thing can do to the revolving parts in both generator and engine isn't hard to figure. Commutator surfaces are marred or otherwise affected. Brushes are worn, bearings are clogged and sometimes worn down.

In Fig. 3, we see Harley May, repairman at the Miller shop, undercutting the mica on a damaged commutator. Prior to this operation, the commutator was turned on a lathe to assure concentricity. Surface of the commutator has been turned down to a new flat finish. When extensive damage has been done to the armature, it is dynamically balanced before it is reinstalled to assure vibration-free performance.

Battered or gouged coils are usually replaced with factory-new products. Instead of stripping off the old insulation, cleaning the wiring and rewinding the coils, Miller prefers to use new stock. Replacement is the best solution, he says, taking the labor cost into account and the possibility of a slip-up in winding.

Three damaged exciter coils, contrasted with a new coil, are shown in Fig. 4. Their damage resulted from neglect and faulty maintenance. Grease and dirt accumulations were allowed to gather and remain on the coils for so long that the coverings eventually rotted away to leave the windings exposed.

Accidents do damage compound coils occasionally, but more often they must be replaced because of gradual deterioration. Fig. 7 shows repairman May inspecting the coils of a welder used in an electroplating plant. Corrosive fumes given off by sulphuric acid have attacked the insulation. Since most welders are built for duty in relatively fume-free areas, their insulation is not armored for this type of service.

Repairman May also adjusts welders for different welding requirements and motor voltages. In Fig. 8, he is rearranging the starter switch changeover links so the unit will operate from 440-volt lines; previously it had used a 220-volt power supply.

Once a welder is stripped down for replacement of a damaged part, all other electrical components are carefully checked. Corrosive fumes, dust or flying grit usually damage more than the outward surfaces, and it's good business for Miller to determine the full extent of the deterioration. He keeps a full stock of spare parts on hand for replacements. Incidentally, he does quite a mail order business on spare parts since many customers prefer to make small repairs themselves.

Replacement parts can be a problem when welders over voting age come into the shop on a trade-in. It may be necessary to have a fitting machined or to adapt another part for use in such an old war horse as that of Fig. 5.

Special Services

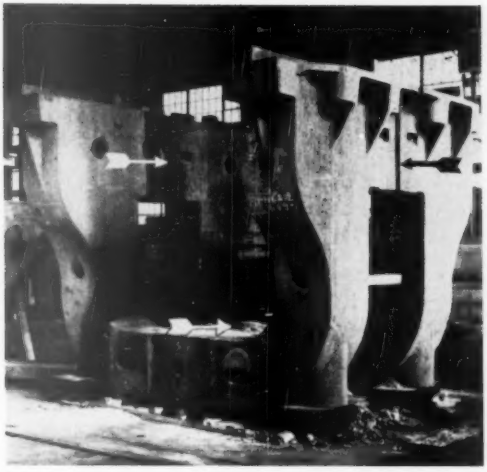
To give the customer a speedy replacement of welding capacity, Miller has worked out a neat idea. When a customer brings in his damaged or inoperative welder, he is given the chance to trade it for a rebuilt welder. He can take the rebuilt home with him for "keeps": all he has to do is to pay its repair bill. What it will cost to fix up the damaged welder he leaves behind becomes Miller's worry. A rebuilt welder freshly painted and tested (Fig. 6) can hardly be told from a new one.

Customers like this feature of Miller's shop service. It saves them lost welding time and may also save on repair costs. All rebuilt welders from the Miller shop carry a one-year guarantee against defective material and workmanship.

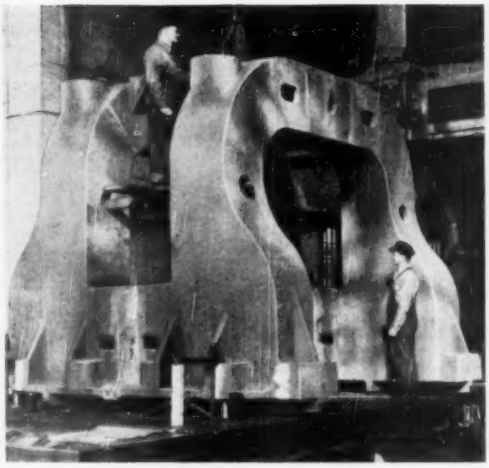
Launching of a welder-maintenance program is a Miller project for the near future. He plans to offer a low-priced service to construction companies, public utilities, pipeline contractors, and others who own fleets of engine-driven welders.

Such a service would include "revving up" the engine and checking the welder for bad connections, grounds, damaged coils, welding characteristics, etc. Equipment badly out-of-order could be brought back to the shop for extensive work; small troubles would be fixed on the spot. Many companies will be glad to pay a small monthly fee for this periodical check-up, opines Mr. Miller.

To start with, the service would be available only to those companies who own ten or more welders in order to make the repairman's trip worthwhile. If the venture succeeds, however, perhaps a route scheme can be worked out so owners of single welders can be visited frequently for the same check-up.



TWO ARROWS at top show gaps for the footing welds. Lower arrow indicates rough collar of the crown weld



HUGE PLANER machined weld collars. You can see one of the footing welds (partly machined) at bottom left

TO JOIN THESE TWO CASTINGS TOOK

10,000 Lb of Thermit

The 50-ton housing of an ingot stripper stand was cast in two halves joined by thermit welding. It took 2,800 lb of thermit to join the crowns, 7,200 lb to make the two footing welds. The work was done in two weeks.

BY J. M. WILSON
Engineer, Thermit Dept., Metal & Thermit Corp.

THERMIT rates an "assist," as they say in baseball parlance, for its part in putting a 50-ton ingot stripper stand housing into service at a large steel mill in the Pittsburgh area.

CAST IN TWO HALVES

The project, under contract to the Morgan Engineering Co. of Alliance, O., began at the Pennsylvania plant where the new housing was to be installed. Because of the foundry's limited capacity, the housing was cast in two halves. Three Thermit welds were specified for the fabrication—two identical welds to join the feet, one to join the two crowns at their centers.

After the castings were made and shipped, somebody at the plant discovered that the legs of both castings had shrunk from 1 to 1½ in. out of line during cooling. The usual step would be to ship them back to the foundry for straightening. To avoid this expense and loss of time, the thermit expert volunteered to correct the trouble on the spot and do it in only two days' time. His offer was quickly accepted.

First, the castings were positioned, crowns up, and a thermit weld was made to join the two crowns at their centers. Heat was then applied with the thermit preheating equipment to bring the legs back into alignment. This part of the job took only two half days—a considerable saving over the two weeks or more that would have been needed to ship the castings back to the foundry. The crown weld, measuring 32 by 29 in., required 2,800 lb of forging thermit.

FOOTING WELDS

To make the two thermit welds at the feet, the castings were turned upside down, crown down, as shown in left picture. Within a day's time, the two welds were made. These welds, each measuring 44½ by 24 in., use 3,600 lb of forging thermit apiece—a total 7,200 lb of footing welds.

All that remained to be done after the mold boxes had been removed and the welds cleaned was to machine the weld collars on a huge planer (right picture). No time had to be consumed in stress relief—it's the nature of a thermit weld to cool from the center outwards, stress free. The entire operation, including the straightening of the legs, required only two weeks from the time the castings were made.

BLACKBOARD INSTRUCTION is given by J. P. O'Neill, head of the welding department at Santa Monica Tech

CLASS MEMBERS learn arc and gas welding while they build a $3,000 exhaust system from 2 to 10 in. pipes

"Stomach Education" in

Each student of the Santa Monica Tech welding course is trained to have practical, versatile and valuable skills to offer when he graduates after his 1,000 hours.

BY FRED M. BURT

IT'S PRETTY well agreed and understood that you can't learn welding just by reading a book. On the other hand, welding along day after day, on a limited number and types of applications, doesn't add up to too much experience and education. Instead of having five years' experience in five years it would be more like one year's experience five times.

STUDENT learns overhead welding working on a useful school project

So what is a young weldor gonna do if he is suddenly called upon to tackle a job the likes of which he has never seen before? If he moves in and knocks it over, he becomes the fair-haired lad. The type the foreman blesses and wonders why th'hell there aren't more of them among his newcomers. But how is he going to get the required ability and versatility?

TRAINING IS THE ANSWER

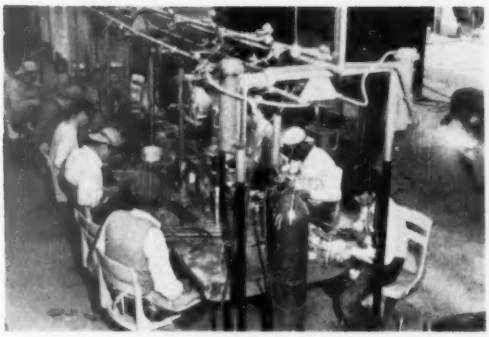
James Patrick O'Neill has one answer in his classes in welding at Santa Monica Technical School, Santa Monica, Calif. The term "stomach education" is Jimmie's idea to describe the diversified 1,000-hr course. In this own words:

"The learner is expected, upon completion of the course, to be able to weld in the four positions: flat, vertical, horizontal and overhead; on the five basic types of joints: butt, tee, lap, corner and edge; on ferrous and non-ferrous metals; to do pipe welding, repair welding and hard-facing. In addition, he is expected to have acquired knowledge of the welding processes, design of welded structures, care of welding equipment, symbols, testing, codes, trade terms, blueprints, metallurgy in regard to welding and a definite understanding of safety procedures."

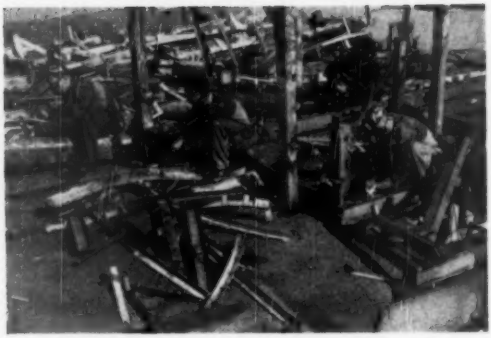
Vocational training schools like Santa Monica Tech are important, Mr. Employer. This one offers the best set-up for the teaching of welding in California. In the completeness and diversity of its equipment, and the thoroughness of practical "teaching-by-doing," it is probably not exceeded in the United States.

Back in 1939, the welding shop had one d-c arc welder and four oxyacetylene outfits. It now has 22 d-c welders (150, 200 and 300 amp), and four a-c (300 amp), used principally in 24 welding booths. There are also 16 aircraft oxyacetylene stations (with hydrogen for aluminum welding) and eight large-capacity gas welding and flame-cutting outfits mounted on carts. Also, there are two modern inert-arc welders. Other equipment includes flame-cutting machines, power shears (up to ¾-in. plate), a high-speed cutter for pipe and bar stock, three 220-volt spot welders, a special jig for straight or bevel flame-cutting of pipe, a drill press, grinders, a test jack for testing weld coupons and many small tools. Around $7,000 worth of all sorts of welding rods are kept in a special storeroom in which the temperature never falls below 70 F.

The war is ancient history now, but the school trained over 5,000 weldors in about 3½ years, with 28 instructors working 'round the clock. Says O'Neill:



MANIFOLD for 16 oxyacetylene stations for aircraft welding. Arc-welding booths are in the left background



FLAME-CUTTING is learned practically. These pupils are scrapping obsolete jigs at Douglas Aircraft plant

Welding

"In teaching, we try to make both the gas and the electric processes clear to our students; to have them become proficient to weld in any position and under all of the predictable circumstances they will encounter on the job. We teach welding symbols, welding codes and the principles of sound design and a fuller appreciation of all of the considerations that enter into good welding practices. We endeavor to stimulate the students' native abilities and develop a friendly and congenial attitude towards co-workers of the future."

UNDERWATER WELDING is taught outside the tank. The student is under pressure and the work submerged to simulate actual underwater conditions

Students and Teachers

Jim O'Neill interviews every applicant for admittance to the classes. Even if he doesn't believe the individual has a good opportunity to make the grade, he will be given a trial period to prove, under close observation, whether or not Jimmie's snap judgment was wrong.

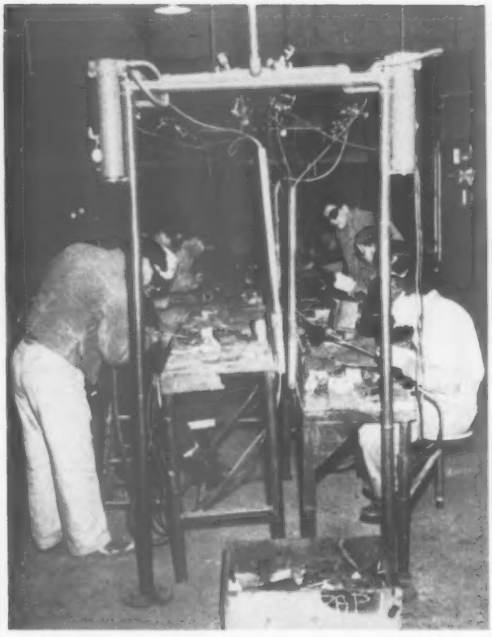
"Principally, we stress the true value of good workmanship—the value accruing to the operator himself—the future he builds for himself. We aid him to understand modern shop practice and the pricelessness of adaptability and imagination. And, since we are living in a world of reality, our training jobs are not all merely practice jobs; wherever practical we have the student do a real job of usefulness, the result of which he may inspect and test to learn from his initial errors.

"And now a few words about the instructors. Stan Willardson is in charge of our aircraft welding. He is a big, likable young fellow—an ex-Navy boxer—deeply interested in the advancement of his trade and the progress of his students. Chad Davis, a soft-spoken Texan, has shown abilities far beyond those promised by the recommendations that made us engage him. His job is to teach arc welding at the night class, and his particular pride and joy is the welding of stainless steel. Bill ('Pop') Stewart is in the tool crib, and Louis Mallette cuts up scrap for the boys to use later on in their welding practice.

"To be eligible, a student must be 16 years or over and have good health and eyesight. The standard course requires 1,000 hours of tutelage, and the student must pass a two-hour written examination and a skill test before he can graduate."

Underwater Welding

The underwater welding tank is located outside the main welding shop building and against its wall. To quote again from O'Neill: "The idea was conceived about four years ago because of the large scale salvage and underwater pipe work. The prints for the tank were supplied to us by the Norfolk navy yard. The tank was constructed from scrap metal. All of the work—layout,



NIGHT SCHOOL! At left Chad Davis instructs class, and at right Stan Willardson teaches aircraft welding

HEAD INSTRUCTOR O'Neill demonstrates butt welding of two pipes. No metal drops when he works underneath

flame-cutting, fitting and welding—was performed by the students. Thus the project gave first-hand practical experience in tank construction.

"We are not training divers. Underwater welding is part of the welding trade, and we felt that an opportunity to learn it should be offered. We believe we have the first set-up of its kind in any school in the country.

"The weldor is under air pressure to simulate an actual dive. He reaches into the filled central tank to work under water. His hands and arms are inserted in a combination of rubber sleeves and gloves; these are affixed to the outer edge of work holes in the dividing steel partition. The welding equipment and workpieces are already in the water tank. A glass porthole at eye level enables the weldor to see what he is doing. Other portholes are arranged to allow the instructor to watch both the welding and the welding operators. The tank is constructed to accommodate two weldors and two helpers."

Under O'Neill himself, the day class is a six-hour session for five days a week, running from 8:30 a. m. to 3 p. m., with 22 students at this writing. The 6-10 p.m. night trade extension class has Chad Davis as instructor. Chad is kept plenty busy during the day, running his own welding shop in nearby Culver City. Stan Willardson, a Douglas Aircraft weldor, conducts the aircraft welding class from 4:30 to 7:30 p.m. on Monday, Tuesday and Wednesday of each week.

What They Learn

At the start of each subject—arc welding, oxyacetylene welding, inert-arc welding, etc.—considerable attention is paid to shop rules, history, health aspects, safety, and other related information. Under arc welding, for instance, would be considered accessories such as clothing, lenses, goggles, and hoods; welding theory; welding circuit; arc analysis; machine adjustment; electrode manipulation and welding terms. This is followed by lectures on the identification of metals: gray cast iron, malleable iron, wrought iron and mild steel.

Next comes the testing of metals by such methods as guided-bend, free-bend, tensile, nick-break, X-ray and acids. The welding of cast iron, stainless steel and aluminum is covered in detail, as are hard-facing and flame-cutting.

A similar thorough course is given on oxyacetylene welding. Under this subject are included brazing, silver brazing, the welding of cast iron and aluminum, pipe welding and hard-facing. Specific instruction is given in the use of oxyacetylene welding in agricultural implement repair, in the oil fields, in small shops and in aircraft factories.

The course concludes with four general lectures on the subjects of: (1) how to get and keep a job; (2) shop ethics; (3) labor and management relations; (4) courses and studies that advance the weldor.

We cannot do better than conclude with another quote from Jimmie O'Neill:

"It is also our aim to develop an appreciation of the application and importance of the welding trade and its contribution to civilization. It is the goal of this course not only to train the individual in the trade of welding, but to inspire him to go on in other studies in order to become a better craftsman and a better citizen. The security and prosperity of this country is largely dependent on its skilled craftsmen."

1—PLASTIC PIPES, 5-in. diam, have flanges welded with gas gun

2—IRREGULAR SHAPES, such as this 6-in. pipe elbow, can be welded by hot gases with the same ease as straight seams are welded in plastics

Hot Gas Welds Thermoplastics

Plastics of the types that soften under heat can be welded with either gas or electric equipment. This article gives you the techniques. The know-how may come in handy some day as plastic materials are now being used in many instances to compete with metals.

BY DR. J. A. NEUMANN
Director of Research, American Agile Corp.

WELDING PROCESSES for thermoplastics, developed in recent years, have brought plastics into competition with the non-corrosive metals and materials used in the chemical industry. Two thermoplastics, polythene and polyvinyl chloride, deserve special attention.

"Polythene," the generic term applied to solid polymers of ethylene, is a tough, horn-like, translucent (paraffin wax appearance) material of considerable flexibility. In heavy sections, however, it is fairly rigid.

Its chemical composition consists of a long chain of polymers (methylene units directly linked up with each other). As may be expected from this composition, polythene is inert to most base chemicals, resistant to moisture and has outstanding electrical properties. It has a short softening range between 212 and 239 F and a sharp melting point, which is of help in the hot gas welding process.

Hard polyvinyl chloride is the most widely used plastic as far as welding is concerned.

Unplasticised or hard polyvinyl chloride is very resistant to acids, alkalis and most oxidizing agents; it is not attacked to any considerable extent by potassium permanganate, chromic acid or nitric acid.

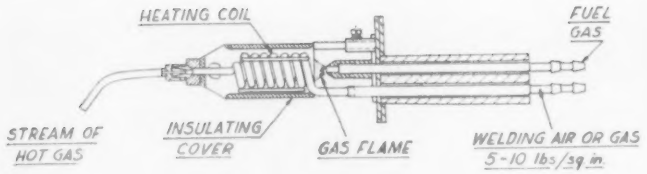
Of the various welding processes, hot-gas welding is the latest developed and the most flexible. It resembles the gas welding of metals in many respects and presents, therefore, no difficulty to weldors familiar with that technique. Parallels between these processes exist in the necessity of heat supply to the seam, the shape and application of welding torches, the use of a spline (filler rod), the preparation of the seam and the wide variety of shapes and cross-sections that may be joined. We will give a detailed description of each of these phases in order to emphasize the similarities with metal welding.

The heat required for the fusion of the base material and the spline may be supplied by either a gas or electric welding torch (see diagrams on page 36 and explanatory text.)

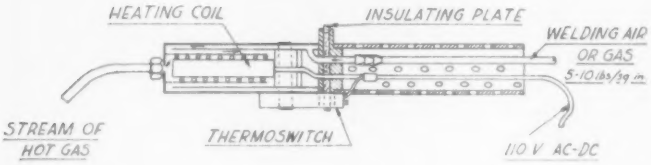
In the gas welding torch, the welding air or gas passes through a spiral, the outside of which is heated by either an oxy-coal gas or an acetylene-air flame. In the electric welding torch, the air or gas is passed through a labyrinth arranged around a heating element.

The heat-carrying agent should preferably be an inactive gas such as nitrogen or carbon dioxide. The gas is supplied at a pressure of approximately 5 to 15 psi. It emerges from the torch nozzle at a temperature between 500 and 600 F and arrives at the surface of the weld at a temperature between 375 to 425 F. About 200 F is lost along the gradient between the tip and the material. The required temperature varies with the type and thickness of the material between the above limits and may be regulated by adjusting the rate of flow of the gas. Different size tips are available for the torch and can be interchanged as required.

For unity in performance and maximum homogenity of the joint, the spline (welding rod) should be of material identical to the parent material so it will soften at the same temperature. This minimizes the



Gas Welding Torch



Electric Welding Torch

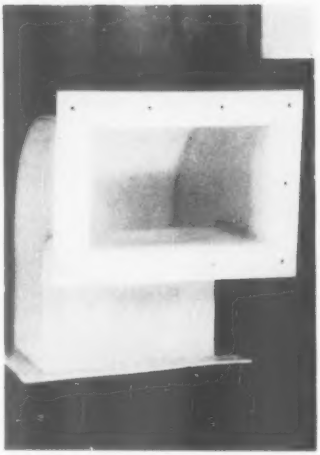
- **In the gas welding torch, the welding air or gas passes through a spiral; outside of spiral is heated by either an oxy-coal gas or an acetylene-air flame. In the electric welding torch, the air or gas passes through a labyrinth arranged around a heating element.**
- **The gas-heated torch, being independent of electrical supply systems, is somewhat more flexible in its application. Equipment is self-contained, offers the additional advantage of short leads when work is done on roofs, etc.**
- **Electrically heated torches are generally lighter weight and are often preferred because they minimize fatigue.**

danger of overheating one or the other members of the joint. A plasticised spline will often improve weldability and mechanical properties of a seam. The weld, however, is more vulnerable to attack by corrosive agents. Another important factor determining the properties of a weld is the size of a spline. The largest size suitable for any particular application should be used to improve the strength, but splines over $\frac{1}{4}$-in. in diameter present difficulties to uniform heating and ready control.

Not Fusion Welding

The main difference between welding of metals and thermoplastics is in this: bonding of plastics takes place when the material is in a softened condition but not fused. Since the softening range of any particular thermoplastic is rather narrow, it's important that the proper heat values are applied to each portion of the weld. The recommended techniques should be accurately followed.

Fig. 1 shows flanges being welded on 5-in. pipe with a gas gun. The spline is held at approximately 90 deg and the torch at approximately 45 deg to the welding surface. The surfaces or edges to be joined are preheated with the spline by a slight oscillating movement of the torch nozzle. Within a matter of seconds, the parent plastic and the surface of the spline soften and take on the appearance of translucency. The torch is slightly withdrawn, but the spline is now firmly pressed into the softened material. The procedure is repeated until the entire length of the seam is completed.



3—DUCT ELBOW (for fume duct) was fabricated by plastic welding

The spline cannot adhere to parent material insufficiently preheated. You can pull it off. Overheating, on the other hand, causes bubbles and darkening of the material. Overheated parts must be cut out before welding can be continued.

Welding should be done in the downhand position. In exceptional cases (not requiring a factor of safety exceeding 0.6), it's allowable to weld in the vertical or overhead position, but this requires skill and experience.

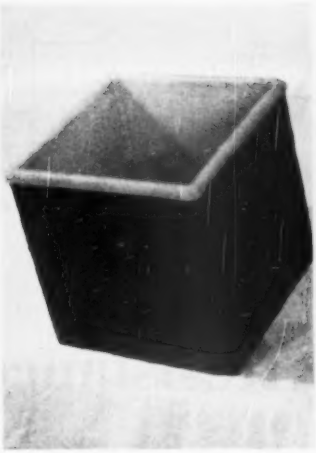
The slight crown increases the strength of the weld. Machining is not recommended unless a smooth surface is an absolute requirement.

All Types of Welds

Joint preparation is similar to the preparation of joints for metal welding. Corner welds, fillet welds and butt welds, with or without a sealing run, can all be made with success. Sheets butted together should be bevcled at an included angle of 60 deg. Beveling may be done with files, rasps, planers or emery wheels. Before welding, the surface should be roughened with scrapers to improve bonding. When the proper technique is applied, butt joints reach nearly 100% of the parent material's strength; fillet welds will be considerably weaker, however, because of insufficient penetration.

One of the outstanding advantages of hot-gas welding lies in the fact that irregular shapes (Fig. 2, a 6-in.

4—TANK LINING: electric torch welds sheets of ⅛-in. material



5—POLYTHENE lining welded for steel tank 18 by 18 by 18 inches

6—FUME HOOD welded of plastic pipes of 22 and 12 inch diameters

pipe elbow) can be welded with the same ease as straight seams. Sections of different thickness may also be joined safely. Welds of heavier material may require several passes, which are all executed with the identical technique. For greatest strength of such joints, the largest applicable size of spline—within the before mentioned limits—should be used.

The speed of welding should be kept between 3 and 10 in. per minute, depending on the type and thickness of the parent plastic, to prevent overheating, burning or improper fusion. Since hot-gas-welded joints do not attain their full strength immediately after welding, a few hours should elapse before the application of any stress.

Jobs for Welded Plastics

Wherever the use of extruded or molded plastics is unsuited or uneconomical, the welding of plastics finds its application. Vats, buckets, jugs, pipe lines, fume ducts (Fig. 3, duct elbow), etc., fabricated by plastic welding processes have successfully handled hydrofluoric, sulphuric and nitric acids, strong alkalis, brine solutions, etc. Unlike metal welds, plastic welds have the same chemical resistance as the parent material.

Another application is for tank linings. Fig. 4 shows a tank lining of ⅛-in. material welded with electric torch; Fig. 5 a steel tank 18 by 18 by 18 in., lined with polythene. In Fig. 6, we see a fume hood fabricated by welding together 22-in. and 12-in. pipes.

Welded plastic piping has been successfully utilized by the brewing industry in the linings of fermentation vats, yeast buckets, funnels and dripping pans. Yet another example where this speedy and economical fabrication process has solved many problems is in piping for laundries for chlorine-containing bleaching lyes and for water softening and purifying equipment.

As stated at the beginning of this article, plastic welding closely resembles metal welding in many phases. There are, however, distinct differences in the technique, which make all the difference between a strong, satisfactory seam and a faulty one. The welding of plastics is not too difficult. The somewhat less extreme conditions, virtual absence of fumes, unobstructed visibility and lower temperatures make for a ready proficiency in the art. The necessity of proper training to attain this proficiency (after a relatively short period) is rather obvious, and it would be desirable to establish several training centers or schools. Instruction should cover all phases from the basic structure of plastics to the techniques applicable for different types of plastics.

Know Your Welding Terms

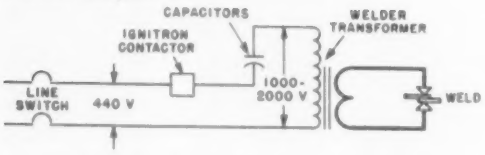
(From "Standard Welding Terms and Their Definitions," American Welding Society, 1949)

Brazing: A group of welding processes wherein coalescence is produced by heating to suitable temperature above 800 F and by using a nonferrous filler metal having a melting point below that of the base metals. The filler metal is distributed between the closely fitted surfaces of the joint by capillary attraction.

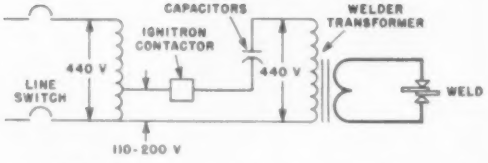
Braze Welding: A method of welding whereby a groove, fillet, plug or slot weld is made using a nonferrous filler metal having a melting point below that of the base metals but above 800 F. The filler metal is not distributed in the joint by capillary attraction. ("Bronze welding," the term formerly used, is a misnomer.)

Flow Welding: A welding process wherein coalescence is produced by heating with molten filler metal, poured over the surfaces to be welded until the welding temperature is attained and until the required filler metal has been added. The filler metal is not distributed in the joint by capillary attraction. ("Burning in," the term formerly used, is a misnomer.)

Series Capacitor



1—HIGH-VOLTAGE control in series capacitor circuit



2—LOW-VOLTAGE control in series capacitor circuit

Are You Up-to-Date on Resistance Welding?

Many new developments have occurred in design and application of resistance-welding machines. Mr. Boice briefs you on such significant advances as frequency changers, metallic rectifiers and slope controls.

BY W. K. BOICE
Industrial Engineering Divisions, General Electric Co., Schenectady

MOST COMMON type of resistance welder is the single-phase, 60-cycle machine. It draws a relatively high, but momentary load of low power factor, single phase. This is the least costly type and is by no means superseded by newer machines. Chief drawback is that the character of the loads drawn will frequently cause sufficient voltage drop to introduce troubles from light flicker or from welders interfering with each other's voltages.

Let's look at a typical conventional resistance welder. Inside the machine is a single-phase transformer that steps the line voltage down to a low value (usually about 15 to 20 volts). The transformer secondary consists of a single turn connected directly to the two arms holding the electrodes. The secondary voltage is sufficient to cause a large current (usually about 10,000 amp or more) to flow through the pieces between the electrodes.

The welder arms and electrodes, being made of copper, have a very low resistance. The weld also has a low resistance. Most of the impedance in the secondary circuit consists of the 60-cycle reactance of the large loop that is formed by the welder arms. In most cases we can't make this loop small because there has to be room to put parts of various shapes and sizes between the electrodes.

Multiply the large welding current by the required secondary voltage; you will usually get a fairly large kva value that must be drawn from the primary line. Because the secondary impedance is mostly reactive, this load has a low power factor (usually 30 to 50%). The load only lasts for a few cycles for each weld: thus it fluctuates frequently from zero to full value. Unless the power supply has a very low impedance, voltage drop troubles may be encountered.

How do you improve character of resistance-welding loads to reduce the kva demand and resulting line voltage drop caused by welders? Several methods have been developed. All available methods of load improvement cost money, however. It may be more economical, therefore, to furnish a power supply system adequate for use with conventional welders, particularly when a large number of machines is involved.

SERIES CAPACITORS

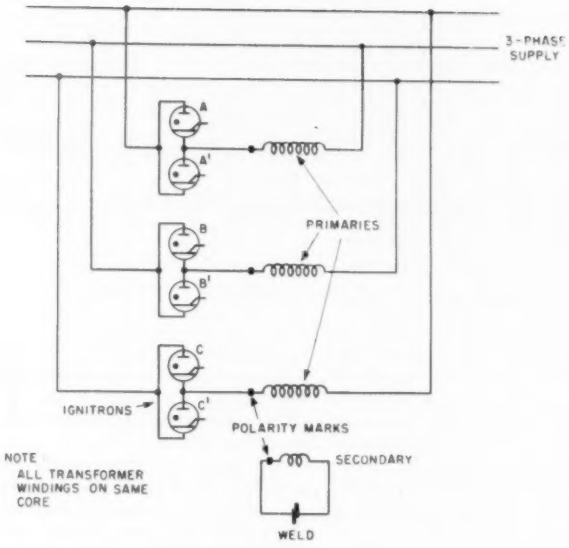
One common method of reducing the kva demand of a welder is to employ a bank of series capacitors especially selected for the welder. The capacitor improves the power factor of the welding load so that it is practically unity at full output (although it is less than unity at reduced output). The effect is to reduce the kva demand and the line voltage drop.

Until recently, it was nearly always necessary to use a special high-voltage welder control with capacitors. The reactive welder current caused such a large rise in voltage (through the capacitor) that the control and the welder had to be designed to operate at voltages considerably above the normal line voltage. Fig. 1 shows a circuit diagram.

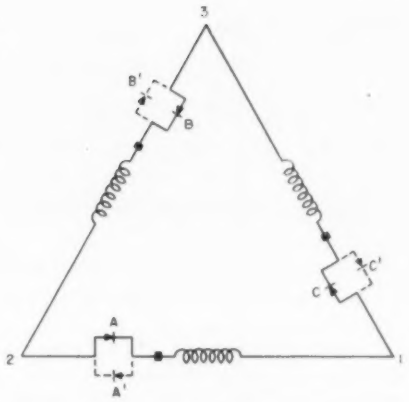
When the control opens the circuit between welds, it is subjected to the sum of the line voltage and the capacitor voltage, usually above 600 volts. It costs money to put in the special controls required, and a high-voltage winding for the welder transformer is also expensive. When capacitors were applied to an existing welder, common practice was to use a high-voltage, step-down autotransformer instead of rewinding the welding transformer for high voltage.

LOW-VOLTAGE CONTROL

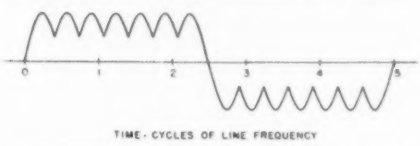
Fig. 2 illustrates an alternative method, successfully employed, which does not require high-voltage control. An autotransformer steps down the line voltage and thus lowers the voltage applied to the welder. The autotransformer output voltage, usually between 110 and 220 volts, is so selected that the welder voltage becomes about 440 volts. Therefore, a standard 440-volt welding transformer may be used.



3—**POWER CIRCUIT** diagram. Tubes A, B, C conduct current in one direction; tubes A', B' and C' in the opposite direction



4—**PRIMARY** connections of frequency changer



5—**SECONDARY** voltage converted to 12 cycles

Frequency Changer

Until recently, this method was recommended only if the required autotransformer voltage was above 200 volts because the igniters of the power tubes of electronic welder controls were not rated to operate below 200 volts. Recent tests, however, indicate that lower voltages may be used; a tentative permissible range has been established.

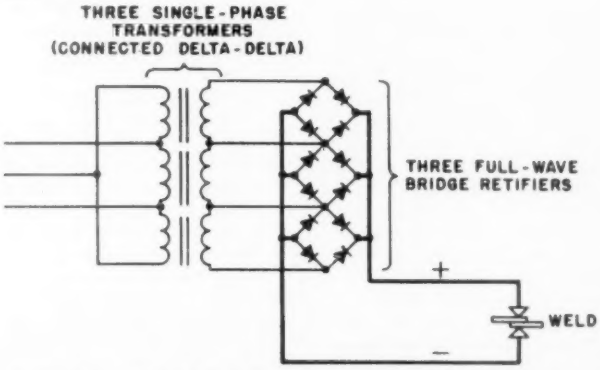
When you lower the voltage applied to the capacitors, you will have to use capacitors rated for both higher current and lower voltage. These low-voltage capacitors bear a slightly higher cost per kva, so the savings on control are offset somewhat by additional capacitor costs. For welders rated over about 150 kva, the increased capacitor cost usually makes the low-voltage scheme uneconomical.

Let's point out the difference between synchronous and non-synchronous electronic controls.

Synchronous controls always start each weld at the same point on the line voltage wave. This point is so selected that the first cycle of current is exactly like every other cycle. Synchronous controls also assure that each weld will have a precisely specified number of full cycles. It adds up to this: the current to every weld is exactly the same if the line voltage and welder impedance remain constant.

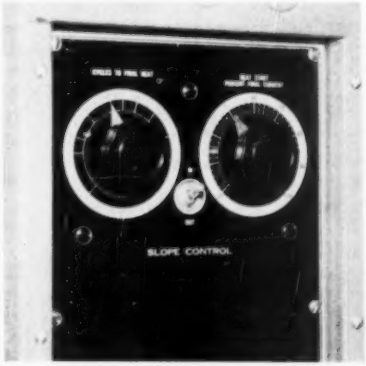
Non-synchronous controls start the weld immediately after the operator

Metallic Rectifier



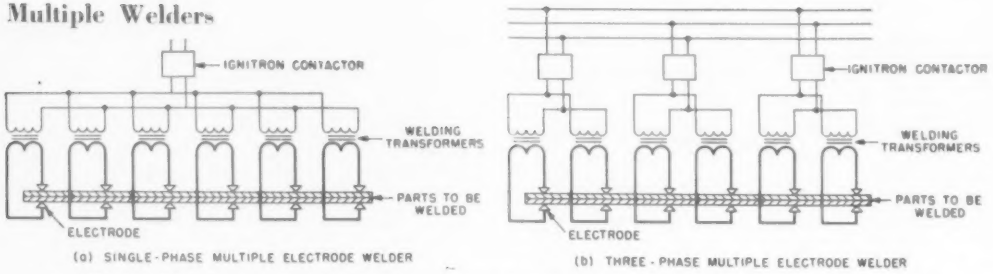
6—**CIRCUIT DIAGRAM** of a metallic-rectifier welder. This type of welder uses magnesium copper sulphide rectifiers to produce d-c

Slope Control



7—**PANEL** of slope control for single-phase welder, mounted on the side door

Multiple Welders



8—CIRCUIT DIAGRAMS for multiple welders. Separate transformers are needed for each pair of electrodes

calls for a weld, which may occur at any time in a cycle. Occasionally, this results in transients that cause the first cycle of current to vary slightly from succeeding cycles. Non-synchronous control is less costly, however, and it may be used when the welding work does not require precise control of this first cycle of current (or of the total weld time).

The low-voltage arrangement depicted in Fig. 2 is intended primarily for use with non-synchronous low-voltage control. You can also use it with synchronous controls if their firing circuits are suitable for use with capacitors.

Past practice has been to mount capacitors in separate enclosed racks that could be placed beside the machine or in any convenient nearby location. Now, recent engineering investigation has disclosed, you can in some cases mount the capacitors either on or inside the welding machine. For this purpose, they may be mounted more closely together than in standard racks, providing the duty cycle of the welder does not exceed 10%. This latter phrase means that the welder is drawing current not over 10% of any one minute. Most spot and projection welders won't exceed the 10% duty cycle.

When you mount capacitors on or inside the machine, you will have one unit of machine, capacitors and control since the control is usually machine-mounted, too. Sometimes an air circuit breaker is also mounted on the machine. By installing the entire equipment as a unit, you save installation space and time. It's also easier to move a welding machine to another location.

Three-Phase Welders

Conventional welders, with or without series capacitors, draw single-phase load. Most power systems, on the other hand, are three-phase. A single-phase load on a three-phase system causes twice as much drop as the same kva of three-phase load at the same power factor. It would be highly desirable, therefore, to have only three-phase loads on a three-phase system.

There are several ways by which you can convert a welding load to a three-phase load. Most are quite expensive. One such method, for instance, is to use a motor-generator set driven by a three-phase motor.

In recent years, two new types of welder have been developed: the frequency-changer welder and the metallic-rectifier welder. These welders not only convert the load to three-phase but also improve the power factor, with consequent reduction in total kva and line voltage drop.

The frequency-changer or metallic-rectifier welder involves considerably less total cost than the motor-generator set.

Frequency Changer Welders

This type of machine produces its welding current at a frequency usually between 4 and 12 cycles per second. We have previously mentioned the reactance associated with the inductance of the welder arms; this is reduced from its 60-cycle value in proportion to the reduction in frequency. Result is a considerable reduction in the impedance to the secondary current. Consequently, the secondary voltage required to produce the desired welding current is much less than for a conventional machine.

Usually, the secondary voltage of a frequency-changer welder is only about five volts. The current required to make a weld is about the same as for a 60-cycle machine. Multiply this current by the lower voltage of the frequency-changer machine, and you will have a kva demand considerably less than for a comparable 60-cycle welder. Furthermore, the power factor is improved.

Still another advantage is the circuit designed so that the load on the supply system is a three-phase load. Because of the lower demand, improved power factor and three-phase character of the load, the voltage drop is much less than with a conventional 60-cycle welder.

The power circuit of a frequency-changer welder is illustrated by Fig. 3. Its basic ingredients are six ignitron tubes and a welding transformer with one secondary and three primary windings, all on the same core. A pair of tubes (connected in parallel with each other) is connected in series with each primary winding. Thus each of the three primary windings (in series with its pair of tubes) is connected line-to-line across a different phase of the three-phase, three-wire supply.

The primaries are connected so that each terminal having a given polarity with respect to the secondary is connected to a different line.

The tubes of a pair, for each primary winding, are connected to pass current in opposite directions

How It Works

The tubes are controlled in two groups of three tubes each. Each group contains one tube of each pair. One group (tubes A, B, C in Fig. 3) consists of the upper tube of each pair. The remaining tubes (A', B', C') constitute the other group. Every tube in a group is connected in a direction corresponding to one polarity of induced secondary voltage. The tubes of the other group are connected to correspond to the opposite polarity of secondary voltage.

Fig. 4 shows the primary connections schematically. The tubes of one group are represented by dashed lines and of the other group by solid lines.

First, the control circuit blocks one group of three tubes from operating. The tubes of the other group are permitted to operate, and each carries current when its anode-to-cathode voltage is in the proper direction. As a result, the tubes of this group take turns carrying current. Current is transferred to the primary winding having the highest applied voltage of the proper polarity. The current in each winding induces a voltage in the secondary of the same polarity. Thus current builds up in the secondary and is maintained in the same direction for several supply-frequency cycles. After a certain number of cycles (predetermined by the setting of an electronic timer), the starting of all tubes is blocked, and the current allowed to decay to zero. The other group of three tubes is then permitted to operate, and current is built up in the secondary in the opposite direction.

You can see now what happens: repeated pulses of current in alternate directions flow through the secondary. Consequently, the secondary carries single-phase alternating current. The frequency of alternation, however, is considerably less than the frequency of the three-phase power supply. It is usually in the range between 4 and 12 cycles per second. Fig. 5 shows a 12-cycle secondary voltage wave. Each half-cycle of this wave lasts 2.5 line-frequency cycles.

Metallic-Rectifier Welders

This type of welder employs metallic rectifiers to produce a low-voltage direct current. The input power factor is good and the load is balanced, three-phase. Power losses in the rectifiers are quite appreciable; even so, the total input kva is less than with a conventional welder.

Fig. 6 is a typical circuit diagram of a metallic-rectifier welder. Magnesium copper sulphide rectifiers are used. These are unusually compact and inexpensive.

Standard ignitron contractors may be used with such welders. Usually, only two are needed (four tubes total) since power can be cut by opening two of the lines of a three-phase, three-wire supply. With this arrangement, you can obtain heat control by taps on the welder. A considerably more costly control is required, though, if this type of welder is to be used for work requiring very fine adjustment of heat.

Harmonics: the input current to frequency-changer or metallic rectifier welders has an appreciable harmonic content. It is nothing much to worry about. The harmonics have a negligible effect on voltage drop and are usually not significant from the standpoint of telephone interference.

Welding Advantages

Let's now take a look at the advantages of frequency-changer and metallic-rectifier welders from the standpoint of welding results. First, both of these types of welders have comparatively low secondary voltages but just as much secondary circuit *inductance* as other types of welders. Consequently, the output current builds up slowly; it may require two or three line-frequency cycles to reach its full value. The slow build-up has been found to reduce the amount of sparking and expulsion of material obtained in projection welding. Also, it greatly increases the number of welds that can be made on aluminum between tip cleanings.

Slope Control

A way has now been found to obtain the same welding advantages with conventional single-phase welders. This is by use of a new "slope control," which may be added to ordinary single-phase control. The slope control causes the current to begin at a low-heat setting and to build up gradually to the higher heat required for the weld. The rate of build-up (slope) is adjustable.

(Continued on page 56)

Ask for the Order

No. 5 in a series of inspirational talks on "Twelve Self-Assignments to Sales Success"

BY RICHARD C. BORDEN

OF ALL known professions, the occupational hazards of a salesman asking for an order are least. Not a life nor limb has been lost in the memory of man. But for some strange reason many an otherwise competent salesman often gets cold feet as he approaches the critical ending period of an interview. Instead of asking for the order, he lets the interview trail off like this:

SALESMAN: Well . . . that completes the story . . . I guess. (PAUSES HOPEFULLY) Have you . . . er . . . any questions?

CUSTOMER: Nope. I think you've covered the points pretty well.

SALESMAN: No questions at all, eh? (PAUSES AGAIN WITH APPEALING LOOK)

CUSTOMER: Nope. But I appreciate the information you've given me, and I'll try to bear it in mind.

(CUSTOMER RISES AND SALESMAN FOLLOWS SUIT)

SALESMAN: Okay . . . well, then, suppose we leave it this way? If later on you should think of some further information that you might want . . . why . . . uh . . . please feel free to call on me.

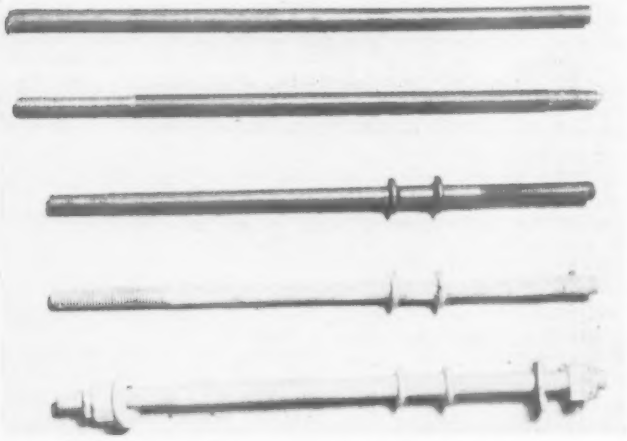
And out he goes, having touched all the bases except the home plate.

Why does he fear to ask for the order that his presentation has earned? Certainly not because of the risk involved. It's perfectly safe, as prevailing mortality tables show.

Don't just hope for the order. Don't just hint for it. And, whatever you do, don't *plead* for it.

ASK for it. Ask repeatedly if necessary. Ask for it as the natural action result of your sales presentation.

These articles, to be published one a month in The Welding Engineer, *are based on the script of a new Dartnell-Borden series of sales films, "Selling Against Resistance."*



1—FROM BAR STOCK to spool stud. Top to bottom, the stages are: cut to length, threaded, upset (note rings), galvanized, finished stud

Flame-Upsetting Makes Spool Studs

BY L. A. GLADU
Process Service Representative, Dominion Oxygen Co., Ltd., Montreal

SPOOL STUDS are used to anchor and separate the cross trees on telephone poles. Recently, a metal-working shop in Quebec City, Que., Canada, undertook a contract for the fabrication of so large a number that the agreed delivery date required a minimum production of 1,500 spool studs a day.

A completed stud may be seen at the bottom of Fig. 1. It is (generally) a mild-steel bar, $\frac{5}{8}$-in. in diameter and 16 in. long. Both ends are threaded. So far production is easy, but now comes the requirement that there must be two fixed rings or ridges 3/16 in. thick and $1\frac{1}{4}$ in. in diameter. These "washers," as they are called, had to be located $1\frac{1}{2}$ in. apart and about $4\frac{1}{2}$ in. from one end of the stud.

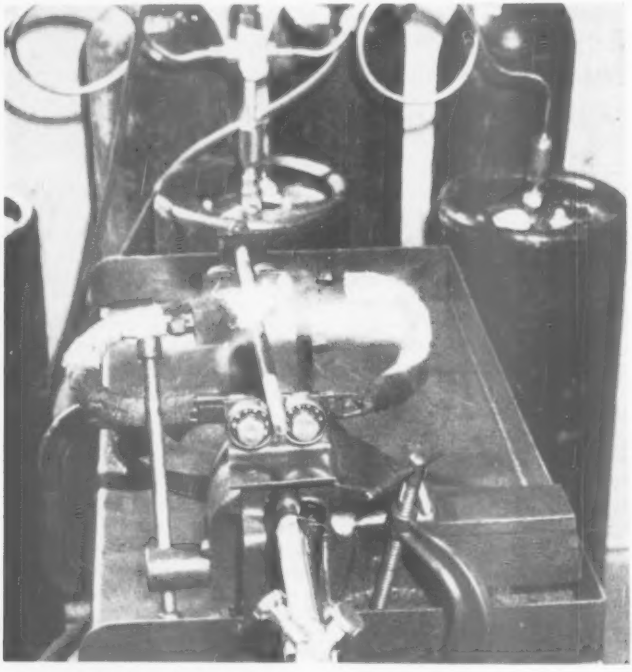
Previously, the fixed washers had been built up by arc welding. This took a little time but was perfectly adequate for normal requirements. The new contract, however, required faster production. Company technicians decided to use a selective oxyacetylene heating procedure and follow it by upsetting or forging in a hydraulic press.

Use Simple Equipment

They built a simple production jig (Fig. 2). It consisted of four ball bearings mounted to support the $\frac{5}{8}$-in. bar horizontally. Two 7-flame heating heads were staggered on either side of the rotating bar. These were offset enough to give a $\frac{3}{4}$-in. length of cool area between the heated sections. The bar was placed in the vee between the bearings and slowly rotated manually until the sections to be upset were raised to a red heat. This took about 12 seconds, at the end of which time the heated sections were at a temperature around 1,800 F.

The hydraulic press used for upsetting had a stationary clamping arm to hold the bar in place at the cool section between the red-hot zones. Two sliding arms applied pressure on both ends of the bar to achieve the desired upset. The forging time took about 10 seconds per bar, and the press could handle four to five bars every minute. After forging of the two washers, the bar was water quenched to prevent scale forming.

By using this simple procedure, the company was able to produce 1,600 spool studs a day. About 100 cu ft per hr of oxygen were consumed and the same amount of acetylene.



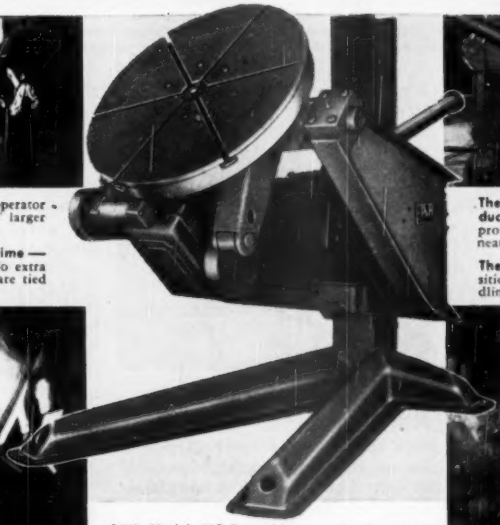
2—HEATING HEADS were staggered to leave a cool strip between the heated sections. Each head has insert tips for seven flames. Oxygen and acetylene were supplied from three-cylinder manifolds through a mixer

P&H Positioners

save time, improve welds and cut costs up to 50%

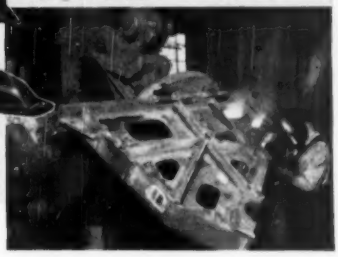
They reduce welding costs — operator welds downhand, uses a "hotter," larger rod, and deposits more metal.

They save valuable handling time — the positioner does everything. No extra men, hoists, or overhead cranes are tied up in rearranging weldment



They permit higher quality work at reduced cost — product appearance is improved — fillets and beads are smoother, neater, more uniform.

They increase employee safety — positioners eliminate the hazards of rehandling weldments.



P&H Model WP-3 positioner — Dual-capacity — 3000 and 4410 lbs. Available with constant or variable-speed table-rotation, and power elevation.

P&H welding positioners pay for themselves in a short time and start making money for you. They are available in capacities ranging from 2500 to 36,000 pounds. Investigate their money-making possibilities in your plant. Call in your P&H representative or send coupon for detailed information.

P&H
HARNISCHFEGER CORPORATION

WELDING DIVISION
Milwaukee 14, Wisconsin

Uniform, top-quality electrodes for every job

Tear out this coupon and mail today

HARNISCHFEGER CORPORATION, Welding Division 2120
4513 W. National Ave., Milwaukee 14, Wis.

Please send me money-saving information on the complete line of P&H Positioners.

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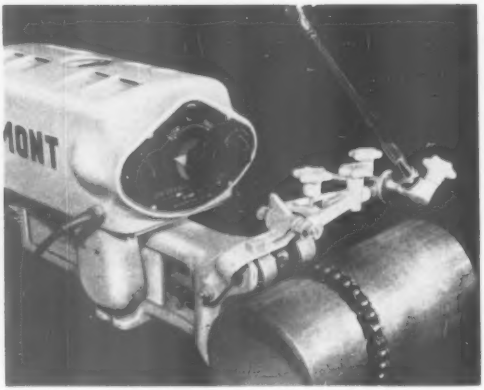
EXCAVATORS • OVERHEAD CRANES • HOISTS • ARC WELDERS AND ELECTRODES • SOIL STABILIZER • CRAWLER AND TRUCK CRANES
DIESEL ENGINES • CANE LOADERS • PRE-ASSEMBLED HOMES

New products

HIGHER tensile strength at 2,000 F than at room temperature claimed for new stainless brazing alloy. It is said to be highly corrosion resistant



AUTOMATIC flame-cutting of pipe now possible with new attachment for Kinmont power unit. Standard torches fit without special tools

Stainless Steel Brazed, Will Hold at 2,000 F

At 2,000 F the strength of a joint brazed with the new stainless-steel brazing alloy, "Nicrobraz", is said to be 99% of the strength of the parent metal. The heat-and-corrosion-resistant brazing alloy can be used with the 300 and 400 stainless series or with Inconel, Monel, tool steel, special stainless or carbon steels.

Tests show that a "Nicrobraz" joint has a higher re-melting point (2,600 F) than its original melting point (about 1,850 F). Tensile strength claimed is 120,000 psi (90% of parent metal strength) for a super alloy specimen at room temperature; at 2,000 F the strength is 99% that of the metal.

Joint clearance should not be over 0.002 in. for highest quality. The brazing is best accomplished in a hydrogen-atmosphere furnace, manufacturer advises, since stainless oxidizes in regular atmospheres.

For many assemblies, "Nicrobraz" is applied to the joint and held in place by "Nicrobraz Cement". The alloy flows into the joint when heated to 2,050 F.

The new alloy is also claimed to be very resistant to organic and alkali solutions. The combination of its advantages has made "Nicrobraz" applicable to new jet engine developments, say company officials. Other applications lie in the food, chemical, automotive, refinery and medical fields. The company offers engineering assistance in developing applications.

Alloy comes in 1-lb containers; the cement in pint cans.

Wall Colmonoy Corp., 19345 John R St., Detroit 3.

* * *

Cutting-Torch Attachment Makes a Machine Cut

New spring-wound travel attachment for cutting torches make it possible to cut 6 ft kerfs with precision. There are no electrical connections and only a simple 6-ft rack to carry from workplace to workplace. Positive drive is provided by the gear moving on the rack.

Aladdin Rod Mfg. Co., 1300 Burton St., S. E., Grand Rapids 7, Mich.

* * *

Projection Makes Nut Weld More Strongly

The shape of the projection on the "Gripco" projection weld nut has been improved for better welding characteristics. These nuts are available with either common threads or with the double-triangle "Gripco Lock" as desired.

Grip-Nut Co., 307-I, South Michigan Ave., Chicago 4.

Scarfing Attachment for Pipe-Revolving Unit

New scarfing attachment for use with the Kinmont power unit cuts or scarfs pipe while it is being turned. It is bolted to the power unit without the need of modifications or special tools.

The cutting torch may be moved vertically and horizontally. It is attached to a protractor dial so that accurate angles may be set. Entire attachment may be swung out of the way while operator is changing work.

Most parts of this new product are heat-treated aluminum alloy castings except for extension rods, which are steel. The 3/4 in. ID tip holder has brass tip adapter bushings in sizes of 1/2, 9/16 and 41/64 in. sizes to accommodate most standard size cutting torches. Other bushings are available.

Roylyn, Inc., 718 West Wilson Ave., Glendale 3, Calif.

* * *

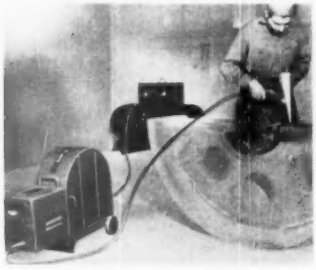
Hard-Facing Electrode Has Wide Applications

"Eutectrode 10" is for general use in hard-facing applications—roller cams, rolling dies, pulverizing rollers, etc. Used with either a-c or d-c, it is claimed to deposit a bead having a hardness of 63-68 Rockwell C. Another advantage, says manufacturer, is the high hardness at high temperatures.

Eutetec Welding Alloys Corp., 40 Worth St., New York City 13.

for welding

Read about a new high-strength at high-heat brazing alloy for stainless. Other fall eye-openers are cutting torch accessories, weldable plastic tubing, new welder developments and safety equipment



Lincoln "Hidensity" Welder Uses High Currents

THE new Lincoln "Hidensity" process uses 600 amp current on a 5/64-in. or 3/32-in. electrode wire for high current densities. Purpose is to create a deeply penetrating arc to allow the use of a high welding speed. Welders used are Lincoln SAE 600 or 900 models.

Little or no edge preparation is necessary with the "Hidensity" process, says Lincoln, meaning a saving in weld metal also.

A "manual Lincolnweld ML-2" outfit is used with the "Hidensity" process and connected directly to the welder. The ML-2 is a self-contained semi-automatic head that can be moved to the work independently of the welder. It consists of a control case, wire reel case, conductor cable and welding gun.

The feed mechanism automatically feeds wire at a preset arc voltage from the reel through the conductor cable to the welding gun. The gun holds inorganic granular flux that is deposited around the high density arc.

With the ML-2 unit, a welder can be used for either "Hidensity" welding or regular "open-arc" welding, but not at the same time.

THE LINCOLN ELECTRIC CO., Cleveland 1.

* * *

Braze, Cut, Anneal With New "Hy-Temp" Gas

FOR use on any application calling for intense, clean, non-oxidizing heat, "Hy-Temp" industrial gas requires only special tips to be burned with any regular torch. Its principal uses are brazing, cutting and annealing. When combined with oxygen, it is said to cut faster and cleaner than ordinary fuel gases.

It is shipped in 60 and 100 lb ICC approved containers. One tank is claimed to outlast 6 to 8 similar size tanks of fuel gas.

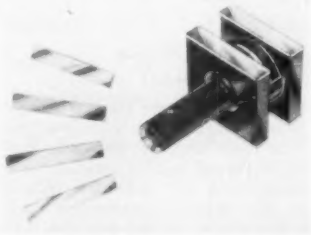
HY-TEMP INDUSTRIAL GAS CO., 413 West Genesee, Saginaw, Mich.

* * *

Dress Electrode Tips With Air-Powered Tool

FOR fast dressing of round electrode tips on single or multiple gun spot welders, a new air-powered tool combines the functions of angle and thin-type dressers. The cutter attachment, $\frac{3}{4}$-in. thick, easily clears obstructions while cleaning the electrodes in the welder. Both Porter and Severance type cutters can be used. Free speed of the cutter is 1,750 rpm.

KELLER TOOL CO., Grand Haven, Mich.



REMOVABLE CONTACT plates for the "Magnetrode" magnetic welding ground provide top operating efficiency. When they become corroded or pitted they can be renewed to bring the ground back to "like new" condition. Plates are steel. Magnetrode Corp., 1708 Main, Kansas City 8, Mo.

Hobart A-C Welder Has No Moving Coils

NEW line of Hobart a-c transformers features welding heat adjustment with an a-c/d-c reactor. No coils move, and all parts are firmly anchored in place. Class B insulation is used with glass covered conductors and with glass cloth between layers.

Main current range control provides five taps for wide welding range without changing cable connections. Above this hand wheel is a knob for adjusting the rheostat. This knob controls the current in the reactor to give about 100 fine-adjustment settings.

Welders can be furnished for operation on single phase, 50 or 60 cycle supply current—either 220/440 dual voltage, 440/550 or 220/440/550 volts. They come in 200, 300, 400 and 500 amp sizes. Attachments are available for adapting welders for inert-arc welding.

HOBART BROTHERS CO., Hobart Square, Troy, O.

* * *

Upright Electric Furnace "Basket Heats" Parts

FOR special heat treating operations such as basket heating, steel hardening and drying of ceramics, a new upright electric furnace is offered. One model has an inside assembly for equalized temperatures up to 1,250 F. The second model has a maximum temperature of 2,000 F. The heat chamber is 21 by 21 by 30 in. Overall dimensions are 60 by 48 by 72 in.

K. H. HUPPERT CO., 6830 Cottage Grove Ave., Chicago 37.

Canvas Shield Holds Off Welding Spatter, Sparks

NEW cloth safety shield stands by itself or can be formed in any shape around the job. Called the "Spa-Fla," it protects workers and property from welding spatter, sparks, hot chips and flying particles. Easels may be attached for field work or to ventilate inside jobs. It can be rolled compactly and carried easily from job to job by one man. It comes in two sizes, 48 by 72 in. and 36 by 72 in.

SAFETY FIRST SUPPLY CO., 425 Magee, Pittsburgh.

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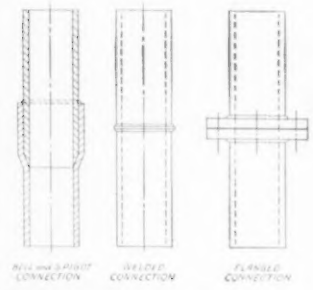

Weldable Plastic Tubes Offered to Industry

NEW polythene plastic tubing, "Agiline," can be used for tubing in the food and chemical industries. It is said to be acid and alkali proof. It cannot, however, be used at temperatures above 150 F nor where acetic acid, carbon tetrachloride, chlorine, dichloride, gasoline, animal oils or whiskey are in contact with it.

Diameters range from 2 to 36 in.; lengths are standard at 4 ft. Joints are made by softening the end 5 in. of a section in 200 F hot water and then inserting it into the heated end of the next section. The resulting joint, when cooled to room temperature, is sealed to air, fumes and liquid, say the makers. For permanent joints, the Agile "hot gas" welding method (see page 35, this issue) may be used.

Curves and near angles may be formed in the tubing by the hot water means also. Other types of connection and shapes are made by welding or flanging.

AMERICAN AGILE CORP., Plastics Division, 5806 Hough Ave., Cleveland 3.

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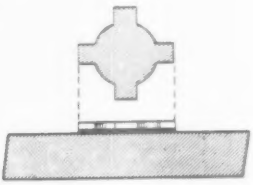


Rolled-on Brazing Alloy Eliminates Rings, Inserts

TO SAVE time and cost in joining small assemblies, silver-brazing alloy is rolled right onto the non-ferrous strip. The "Braze-clad" process saves using rings, washers, preformed shapes and coils. Since the entire joint surface of the parent metal is covered with brazing alloy, there can be no voids caused by dry spots and oxide islands.

Some metals tested successfully with this process are nickel silver, brass, bronze, beryllium copper, nickel and Monel. "Braze-clad" metals can be blanked, stamped and drawn in the usual manner, whether clad on one side, both sides or in inlaid strips. Multiple joints with induction or furnace brazing methods are also possible with the new process.

Typical applications include hollow handles for cutlery and silverware, cap-on-rod joints, seamed tubes, springs, studs, contact arms, etc.

ROLLED PLATE DIVISION, American Silver Co., Inc., Flushing, N. Y.

* * *

Weld Cracks Shown by Dye Penetrant

FOR INSPECTING the surface of weldments, forgings, castings, etc., the "Dy Chek" process indicates flaws by bright red lines or dots on a white background. No electricity, lighting or other special equipment is used.

Equipment needed includes three "Dy Chek" liquids: surface cleaner, dye penetrant and dye mark developer. Three brushes, sprays or tanks are also needed as are some rags or waste.

To inspect a part, you clean the surface with the cleaner. Vapor blasting or acid etching may be done at this point, but not sand blasting since it might close up small openings. The dye penetrant is then brushed, sprayed or dipped onto the part after which it is allowed to stand for at least five minutes. The penetrant is then removed by swabbing with the cleaner until all visible dye is removed.

Last step is to apply the developer by brush or spray in a very light coat. As part dries, any dye penetrant left in tiny flaws will be drawn to the surface by the developer and will show up as a line or red dots.

DY CHEK CO., DIVISION OF NORTHROP AIRCRAFT, INC., 1515 East Broadway, Hawthorne, Calif.

* * *

Steel Inside Plastic Strengthens Safety Glasses

TO GIVE the temples of new safety glasses increased pliability and strength, a flat steel spring ¼-in. wide is imbedded in the center of the moulded plastic. Ends of the temples are ribbed. The clamp-like action of the spring keeps the glasses firmly in place, say company spokesmen.

Glasses are furnished with "snap-in" 48 by 51 m/m drop eye oval, 1.25 or 6.00 diopter curve lenses in both green or clear hardened glass. In appearance, they are said to closely resemble prescription glasses.

SELLSTROM MFG. CO., 626 North Aberdeen St., Chicago 22.

NEW PRODUCT BRIEFS

Rubber covered metal grommet insulates blanked holes in metal to prevent chafing and cutting of cables, conduits, etc. Called the "Sta-Put" Series 3120, it is installed from the face side with the aid of a special hand tool. AUTOMOTIVE RUBBER CO., INC., 3601 Epworth Blvd., Detroit 4.

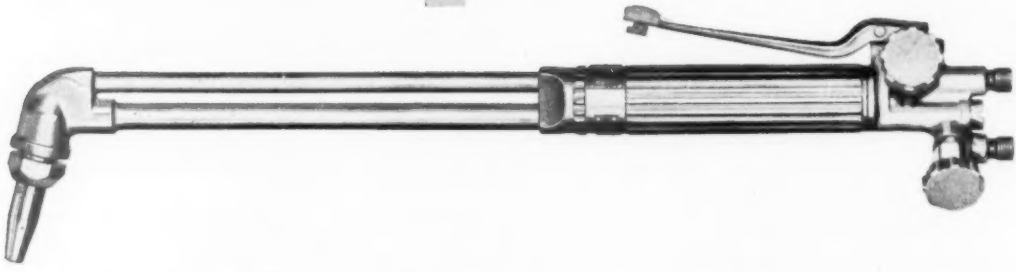
* * *

Fast-Slide Action on a new machinist's vise allows complete open or close in 1 second. Jaws are specially hardened and are replaceable. No-pinch handle protects operator's hand from blood blisters. DODGE MFG. CORP., Mishawaka, Ind.

(Continued on page 76)

Do all this with *One* OXWELD Trade-Mark Blowpipe

- Cut steel up to 12 in. thick
- Bevel parts for fabrication or repair
- Gouge grooves of many sizes and contours
- Deseam semi-finished steel forms
- Cut risers and "wash" pads
- Prepare plate edges for welding
- Remove rivets and pierce holes
- Trim plate and structural shapes
- Powder-cut stainless steels and other oxidation-resistant metals
- Cut guided circles and straight lines
- Scrap obsolete equipment for profit



Whether your work includes one or more than one of these jobs, the OXWELD C-32 Blowpipe will save you time and money. This all-purpose cutting blowpipe, with its wide variety of inexpensive nozzles and attachments, easily handles these jobs—and many others—with outstanding efficiency, speed, and convenience.

Like all OXWELD products, the C-32 is built to give you many extra years of economical and **trouble-free service** under every condition of use. Available in your choice of 3 lengths (20-, 26-, and 32-in.) and 3 head angles (75-, 90-, and 180-deg.) to suit your exact needs. Write or phone today for full information about this cutting blowpipe — or regarding welding blowpipes, regulators, cutting machines, or acetylene generators.

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Mallory Designed Welding Dies

Add Speed, Uniformity, Economy To Production Welding

The Mallory designed and built die, pictured at top, welds an electrical contact to a reed in eight stations at a rate of 1000 units per hour. Each station is an independent unit that is easily replaced for dressing or repair. Each station has its own water cooling system and device for automatic ejection of welded parts.

No resistance welding production die is too large or too small for Mallory ingenuity.

Mallory designed dies are setting new standards of performance for uniform high quality at desired production rates . . . on single, double and multiple station equipment.

In addition, all Mallory designed dies afford the best possible operator motion efficiency . . . and feature easily removed inserts, low cost replacement parts, special alloys for maximum service life, and provisions for most effective water cooling . . . all combining for maximum economy.

That's service beyond expectations!

Mallory die design and building know-how is the result of more than 20 years of welding and alloy experience . . . enables Mallory to choose the best material for each job, the best design for the required results.

Mallory can supply complete Resistance Welding needs. Merely send prints, sample parts, production requirements, available machine data, platen dimensions. What Mallory has done for others can be done for you.

In Canada, made and sold by Johnson, Matthey and Mallory, Limited
110 Industry Street, Toronto 15, Ontario

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Power Supplies
Resistance Welding Materials

P. R. MALLORY & CO. Inc.

MALLORY

P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

Specific Gravity and Weight of Solids

Material	Specific Gravity	Average Weight, Lb per Cu Ft
Aluminum	2.7	166
Antimony	6.7	418
Asbestos	2.1-2.8	153
Ashes	0.63	40
Asphaltum	1.39	87
Bauxite	2.55	159
Brick, soft	1.6	100
common	1.79	112
hard	2.0	125
pressed	2.16	135
fire	2.24-2.4	145
Brickwork, mortar	1.6	100
cement	1.79	112
Cast iron, soft	7.0	436
hard	7.3	456
malleable	7.3-7.4	456
Cement, Portland	3.05-3.15	190
loose	1.44	92
barreled	1.84	115
slag	1.8-2.6	130
Cinders	0.63	40
Clay	1.92-2.4	137
Coal, anthracite	1.4-1.8	97
bituminous	1.2-1.5	84
lignite	1.1-1.4	78
charcoal	0.27-0.58	18
Coke	0.27	30.8
Concrete	1.92-2.48	144
Copper	7.06	556
Cork	0.22-0.26	15
Dolomite	2.9	181
Earth, dry, loose	1.2	75
packed	1.5	93
moist, loose	1.3	81
packed	1.6	100
Mud, flowing	1.7	106
packed	1.8	112
Emery	4.0	250
Feldspar	2.5-2.6	159
Glass, common	2.5-2.7	164
crystal	2.9-3.0	184
flint	3.2-4.7	188
plate	2.45-2.72	161
Gold	19.3	1205
Granite	1.9-2.3	126
Gravel, dry, loose	1.4-1.7	90-105
packed	1.6-1.9	100-120
wet	1.9	120
Gypsum	2.08-2.4	140
Ice	0.88-0.92	55-57
Iron	7.86	490
wrought	7.8	486
Lead	11.37	708
Leather	0.86-1.02	59
Lime, quick, bulk	0.8-0.92	55
Limestone	2.3-2.9	160
Magnesia, carbonate	2.4	150
Magnesite	3.0	187
Magnesium	1.75-1.8	111
Manganese	7.4	463
Marble	2.56-2.88	170
Masonry, dry	2.24-2.56	150
dressed	2.24-2.80	160
Mercury	13.55	848
Mica	2.80	175
Monel	8.87	554
Mortar	1.44-1.6	95
Mud	1.7-1.8	111
Nickel, cast	8.27	516
rolled	8.67	541
Paper	0.70-1.15	58
Paraffin	0.87-0.91	56
Pitch	1.15	72
Plaster	0.86-0.91	53
Plaster of Paris	1.5-1.8	103
Platinum	21.45	1336
Porcelain	2.3-2.5	156
Potassium	0.87	54
Pumice	0.37-0.90	40
Quartz, flint	2.5-2.8	165
Rubber, cured	1.0-2.0	95
Salt	0.78-1.25	49-78
Sand, dry	1.44-1.76	100
wet	1.89-2.07	125
Sandstone	2.2-2.4	145
Shale	2.6-2.9	172
Silicon	2.49	131
Silver	10.5	655
Slag, bank	1.1-1.2	69
screenings	1.5-1.9	107
Slate	2.72-2.83	175
Soapstone	2.65-2.8	170
Sodium	0.97	61
Soil	1.10	70
Starch	1.53	96
Steel, cast	7.85	490
Steel, low carbon	7.85	490
high carbon	7.81	486
stainless	7.83-7.93	490
tool	7.76-7.81	483
Stone, various	2.16-3.4	135-200
crushed	1.6	100
Sulphur	1.93-2.07	125
Talc	2.6-2.8	169
Tar	1.2	75
Terra cotta	1.9	119
Tile	1.76-1.92	115
Tin	7.3	455
Titanium	5.3	218
Tungsten	17.5	1186
Uranium	18.7	1167
Vanadium	6.0	343
Wood, soft	0.36	22
hard	0.65	43
Water (68 F)	0.998	62.3

New! VICTOR CUTTING TORCH

with Stainless Steel Head and Tube Assembly

CTS-400 Series

Rugged stainless steel tip nut, head and tubes.

Uses all standard Victor cutting tips.

New high-capacity, cutting oxygen valve—operated over half million times without detection of wear.

New oxygen and fuel control valves with "O" ring pressure seals—no outmoded packing, no take-ups, no adjustments needed.

Test it *on your severest cutting job . . . see for yourself how fast it cuts, how cool it stays.*

Here's the torch you've been waiting for. Cuts longer and faster than other torches without overheating because mixer and mixer tube are made of high-heat resistant copper alloys—no danger of mixer failures from overheating. Mixer itself is Victor's famous spiral mixer, designed to prevent backfire and flashback.

The stainless steel head and tube assembly is a single unit and can be replaced without buying a complete torch. Comes with either 90° or 75° head. Standard length is 21″; 27″ or longer available on special order.

Call your Victor dealer NOW . . . ask him to demonstrate this new, stainless steel torch on your toughest cutting job.

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Welding and Cutting Equipment Since 1910

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A Welding Engineer Reader Service

1 ARC-WELDING ACCESSORIES—Metal & Thermit Corp., New York City 17. 32-page catalog covers the M & T lines of electrode holders, helmets, cable, ground clamps, goggles, cleaning tools and protective clothing. Excellent diagrams are given of holders, cable connectors and inert-arc welding heads.

2 HARD-FACING ELECTRODES—Sight Feed Generator Co., West Alexandria, O. Bulletin describes "Rex-arc", "Rex-A-Lits" and "Rex-Tung" hard-facing and manganese rods and electrodes for oxyacetylene and arc application. Welding procedures are discussed and illustrated.

3 LOW-TEMPERATURE ALLOYS—Frigilatem Welding Alloys, Inc., Neptune, N. J. 8-page bulletin tells about the new "Frigiloy" welding rods and "Frigilatem" electrodes for low-temperature applications. Applications, welding procedures, identifying color code and diameters are listed for each rod.

4 DYE-PENETRANT INSPECTION—Dy-Chek Co., Division of Northrop Aircraft, Inc., Hawthorne, Calif. Single-sheet bulletin tells about the "dy-chek" method of inspecting forgings, weldments, plate, tubes of any metal. See page 45.

5 ABRASIVE DISCS—Bay State Abrasive Products Co., Westboro, Mass. Bulletin describes the "DuraCut" abrasive discs for cleaning alloy, mild and stainless welds. Sizes, grit sizes, structures and speeds for various wheels are listed and back-up instructions shown.

6 CUTTING GAS—Hy-Temp Industrial Gas Co., Flint, Mich. 4-page pocket-size folder gives chemical and physical properties of "Hy-Temp" industrial gas. This gas may be used for cutting, brazing, silver soldering, annealing, hardening and scarfing—see page 45.

7 STEEL COLOR CODE—United States Steel Supply Co., Chicago 4. Four-color 9 by 9 in. chart printed on glossy stock shows the color codes for lines of alloy, aircraft, stainless, carbon and structural steels.

8 STEEL "DISINTEGRATOR"—Ansaldi Automatic Steel Disintegrator, Detroit 8. 4-page, two-color bulletin describes the Ansaldi "disintegrator," a product being employed to remove broken taps, drills, studs or reamers from holes drilled in die sections or castings, etc. Photos show the portable and stationary units available.

9 CABLE CONNECTORS—Mines Equipment Div., Joy Mfg. Co., Pittsburgh 22. Bulletin tells about new self-locking welding cable connectors. Construction features, materials used and advantages are listed. See page 76.

10 WELDOR'S GLOVES—The Boss Mfg. Co., Kewanee, Ill. 8-page catalog No. 61 describes leather, flannel, leather-palm and other types of industrial gloves. Last page is a handy "How to Select Gloves" section including illustrations.

HOW TO ORDER: Fill out one of the small card sections completely (name, address, your company, etc.) for each piece of literature you would like to have. Each card section must be completely filled out; do not use ditto marks. Each circle must contain the number that appears with the item on which you desire further information.

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11 BRAZING FLUX RESEARCH—United Wire & Supply Corp., Brazing Alloy Div., Providence 7, R. I. 12-page booklet tells about the various types of brazing fluxes available and how they work. Subjects covered include cleaning, removing of residue, health factors, gap clearances, surface tension, etc. Photomicrographs of brazed joints illustrate points.

12 MOTOR-DRIVEN WELDER—The Lincoln Electric Co., Cleveland 1. 4-page, two-color bulletin 1302 pictures and describes the Lincoln "Shield-Arc" SAE motor driven welder. Specifications and dimensions for a-c and d-c models are tabulated completely. Optional equipment is listed on back page.

13 WELDING ALUMINUM—Welding Engineers, Inc., Norristown, Pa. 12-page bulletin No. 9 describes company facilities for design and fabrication of welded aluminum structures. Data on physical and chemical properties of aluminum are given. It also discusses use of aluminum under —300 F temperatures.

14 INDUCTION HEATING—Electric-Arc, Inc., Newark 8, N. J. Bulletin gives information on the redesigned Model BHD-5 induction heater for stress relieving of welded piping. Operating demands, characteristics and capacities are discussed.

15 VENTILATING TUBING—Flexible Tubing Corp., Branford, Conn. 8-page, two-color Catalog 5-4 illustrates flexible cloth-covered tubing for exhausting welding fumes, dust, smoke, etc. Construction, heat and acid resistance, fittings and applications are explained and shown.

16 WELDED TUBING—The Babcock & Wilcox Tube Co., Beaver Falls, Pa. Bulletin TB-331 gives technical data on resistance welded steel boiler tubes. Tables are furnished on maximum allowable working pressure for various diameters and gages and weight in pounds per lineal foot of tube.

17 TINNING PAINT—Swiss Laboratory, Cleveland 14. Single-sheet, four-color catalog page describes a "tinning paint" for soldering and tinning on welds. Directions for applying the paint are given and explained.

18 STUD WELDING—Nelson Stud Welding Division, Lorain, O. 16-page illustrated booklet is a reprint of the chapter on stud welding from the third edition of the AWS *Welding Handbook*.

19 AIR CONTROL VALVES—Ross Operating Valve Co., Detroit 3. Bulletins 101, 301 show various hand-and-foot solenoid control valves for spot, seam, portable gun and flash welders. Black-and-white prints show operating features and give dimensions and specifications.

20 MAGNETIC GROUND—Magnetrode Corp., Kansas City 8, Mo. Single-sheet bulletin tells about the new Model 750 "Magnetrode," a model featured by removable contact plates. See Page 45.

21 TRAILER HITCH—Husky Hitch, Monrovia, Calif. Single-sheet two-color bulletin is on the "Universal Husky Hitch", a welded attachment to a passenger car to permit the use of a trailer. Instructions are given for welding the hitch to the car. See Page 76.

22 CUTTING ATTACHMENT—Aladdin Rod Mfg. Co., Grand Rapids 7, Mich. Single-sheet bulletin describes the "Straight Liner Acetylene Cutting Machine," a spring-wound attachment that allows straight lines to be cut with only a manual cutting torch. Operating instructions are included. See Page 44.

23 HARD-FACING ALLOYS—Victor Equipment Co., Alloy Rod and Metal Div., Los Angeles. 4-page Bulletin Form 312 gives applications, diameters, and method of welding "Victortube" and Victor "Tungsmooth" rods and electrodes for hard-facing blades, paddles, crushers, plows, mixers, etc.

24 STUD WELDING—Cyc-Arc Ltd., London, N.1, England. Small booklet relates the history of the Cyc-Arc process and the development it has undergone. Its application in shipbuilding, construction and other industries is described and illustrated. New uses are also indicated.

25 LITHIUM CHEMICALS—Foote Mineral Co., Philadelphia 44. 28-page booklet reviews and forecasts developments in lithium chemistry since 1940. Lithium fluoride and lithium chloride are important ingredients in new welding and brazing fluxes.

26 FLEXIBLE SHAFTING—Elliott Mfg. Co., Binghamton, N. Y. 4-page bulletin explains the fundamentals of industrial flexible-shaft units and how to figure torque and horsepower. Diagrams show the various parts of a flexible-shaft mechanism.

27 PAINT STRIPPING—Oakite Products, Inc., New York City 6. 14-page booklet discusses four methods for removing paint from metal surfaces: the hot "flow-on" method, the cold-spray, the steam gun and the tank immersion. Also mentioned are materials for preparing surfaces for repainting.

28 AIR-GAS TORCHES—Duo Flame Corp., Columbus 15, O. 6-page pocket-size folder on the "Duo Flame" compressed air-gas industrial torch. Torch is shown and advantages explained. Model numbers and specifications are also tabulated.

29 WELDING CATALOG—Special Welding Alloy Co., Long Island City 1, N. Y. 24-page, pocket-size catalog gives descriptions and pictures of gas and arc welding equipment, low-temperature brazing and welding rods, electrodes, silver-brazing rods and miscellaneous welding accessories.

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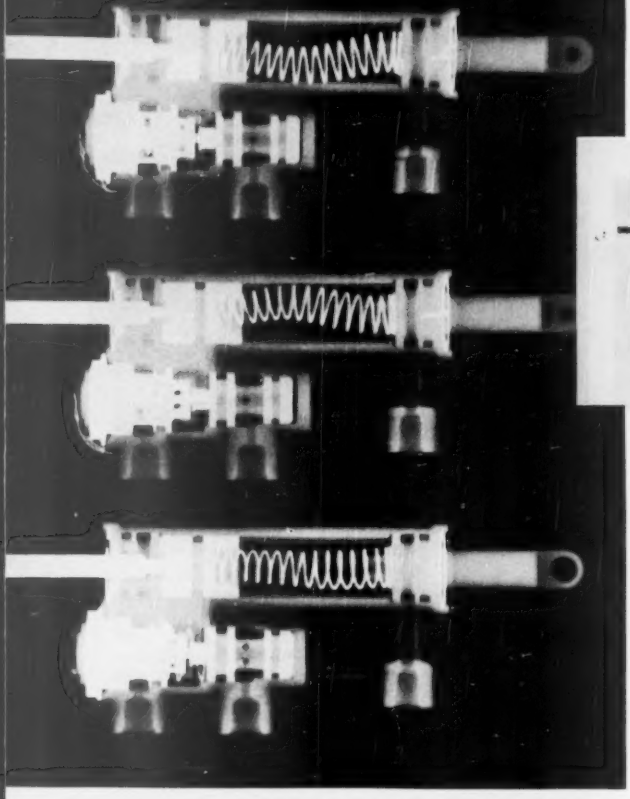
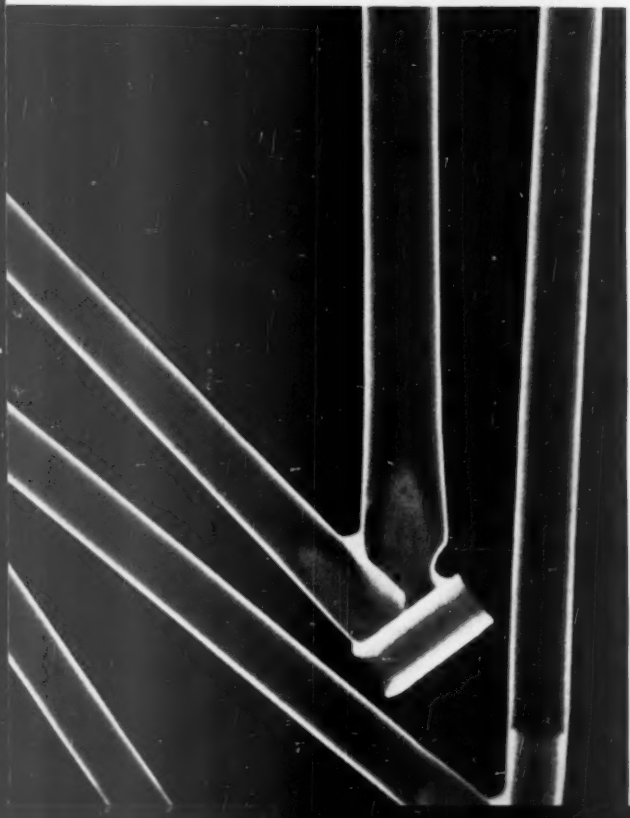


RADIOGRAPHY

goes beyond inspection of castings and welds

CHECKS ASSEMBLIES

Two of a group of hydraulic cylinders failed to function. Disassembly would have taken too long and involved breaking seals. Radiography compared the two with a good cylinder and revealed not only the compression springs rubbing on cylinder walls but also the absence of a second coil spring in the valve assemblies.



EXAMINES ENCLOSED SURFACES

Even though treated and sealed, these landing gear struts of an amphibian plane can develop internal corrosion and become weakened. Radiography alone can provide an examination of these internal surfaces. So the manufacturer has made it routine in the periodic inspection for service and safety of its amphibians.

Your x-ray dealer will gladly discuss the many ways radiography can aid your business by increasing foundry yield, checking welds and doing many other important and valuable non-destructive inspections.

EASTMAN KODAK COMPANY
X-Ray Division, Rochester 4, N. Y.

Radiography . . .

another function of photography

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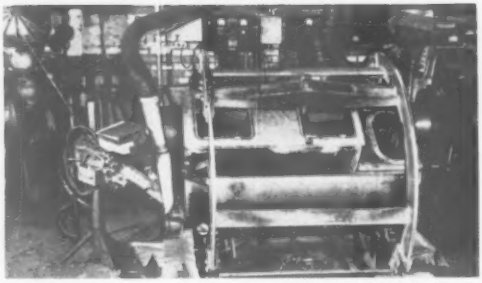
WELDED "SPUDS" built to anchor dredges. Each of these big cylinders is 78-ft-long by 34 in. in diameter with walls of 1¾-in. plate



Courtesy The Linde Air Products Co.

TOP AND BOTTOM of Kalamazoo hot-air furnace are welded simultaneously by two submerged-arc heads. Note the big "roll-over" fixture

Not for Korea

THE LONG, slim tube in the picture above is not a torpedo nor yet a new type of rocket bomb. It was fabricated for purely peaceful purposes by the San Francisco yard, Bethlehem Pacific Coast Steel Corp., Shipbuilding Division.

By this time you've guessed what it is: a harmless dredge spud. For those not familiar with dredging operations, a spud as defined by Webster, is: "A sharp-pointed vertical post or pile which can be forced by a tackle or by power through a socket in a floating or a land dredge or scow to anchor it."

The two spuds in the picture above are hollow tubes of 1¾-in. wall thickness, each 78 ft long by 34 in. in diameter. The 1¾-in. plate (high tensile steel) was formed into half rounds by means of a 500-ton press. Six of these half cylinders were joined by submerged-arc welding to make the long cylinder of the spud.

* * *

Pipe Grate for Welding Table

By Andrew Vena

ON MY JOB as a tack weldor with The Budd Co., Philadelphia, I was having a great deal of trouble sliding the workpieces on my steel arc-welding table. Because of arc splatter, fallen molten steel and craters left by striking the arc, the table top was extremely rough, pitted and defaced. No matter how often the table top was cleaned, the condition soon repeated itself. They promised me a copper table top, on the theory that arc splatter would not stick to copper, but a slab of copper big and heavy enough to serve was too hard to get—and expensive. Besides there was no real assurance that it would solve the trouble.

The remedy proved to be simple: a grate on which the work was free to slide while the splatter dropped to the table top below. I made the grate out of two lengths of 1¼-in. pipe (scrap) and several shorter pieces of ¾-in. pipe for cross bars. The smaller "bars" run in the direction in which the work is required to slide. They were placed on top of the two 1¼-in. pipes in order to raise them sufficiently to clear the splatter and stuff stuck to the table.

I placed the two longer pipes a couple of inches in from the ends of the smaller ones and welded the latter (cross pipes) in place at both ends. The ends of the smaller pipes were bent down a bit so they wouldn't catch on the work and annoy me. As a final step, the grate was tack welded to the four corners of the table.

It now takes only the slightest effort to slide the work to properly position it. This grate has been a great help to me as my job is with repetitive production work where the quota is 700 pieces per day and each piece takes six arc tacks. The splatter falls through the grate to the table top and no longer interferes with the movement of the work.

I can recommend the idea to anyone faced with a similar problem. Steel rods could be used instead of pipes, of course.

Submerged-Arc Fixture

KALAMAZOO STOVE CO., Kalamazoo, Mich., speeds the production of a hot-air furnace by making two girth welds at once. Submerged-arc welding heads are used in conjunction with a roll-over fixture. Both ends are welded at the same time.

The "wheels" or end pieces of the roll-over fixture were flame-cut to circular shape and then cut out to fit the shape of the air furnace. Braces and supports tie the two circular pieces together. Sections of the wheels are hinged to facilitate loading and unloading. Motor-driven rolls turn the fixture at the proper welding speed.

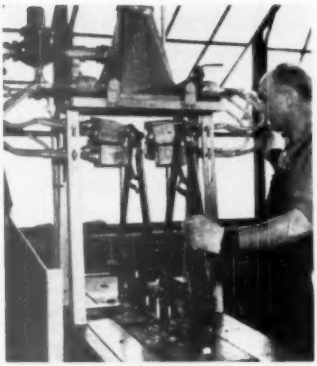
The two welding heads are placed on stationary pedestals. The one at the left (see picture above) makes a continuous weld through the flanged bottom to join it to the shell of the furnace. The submerged-arc head at the right, adjusted at the top of the cylinder, makes an outside weld to join the top of the furnace to the shell.

A complex shape-welding job can frequently be broken down into two or more simple operations. This is an excellent example. By breaking down the complex welds into simple straight-line and girth welds, the fabricator was able to mechanize practically all welding operations. Handling costs are cut considerably by welding both ends of the furnace simultaneously.

Welded Beer Barrels

NEW BEER BARRELS by Aluminum Company of America have a 31-gallon capacity and feature a deeper chime and more rugged construction. The inner surface of high-purity aluminum is said to simplify cleaning and to protect the taste, color and clarity of the beer.

The pure-aluminum interior is bonded to an outer surface of a high-strength, heat-treated aluminum alloy. Bungs are forged from a solid piece of aluminum and are attached by argon-arc welding.



GAS-AIR BURNERS aid silver brazing of the steering heads to motorcycle frames

Mechanized Silver Brazing

HARLEY-DAVIDSON Motor Co., Milwaukee, silver brazes steering heads to motorcycle frames at the rate of 34 an hour by using gas-air burners in connection with an electric timer. The latter limits the heating cycle to 1¾ minutes.

As shown in the picture, the equipment consists of four block burners and a gas-air mixer. Air is mixed with natural gas of 970 Btu per cu ft in an approximate 10 to 1 ratio. This results in a reducing flame. As shown, the burners are held by a two-position fixture. A bypass around the solenoid-type valve permits pilot gas during the fixture loading period.

* * *

Ratproof Ships

By John Kent

THE ONLY WAY to build a ratproofed vessel, according to the U. S. Public Health Service, is to construct it so that "all harborages have been eliminated, and the movement of rats is limited by preventing their access to other parts of the vessel."

Simplified, this means that you build the rats out of possible nesting or breeding places and then stop them from having the freedom of the ship. Result: no rats.

It sounds easy, but it's not. Take, for example, the expanded-metal sections that cover wireways and ducts. If one of these is removed, it opens up a multitude of places for rats to enter and hide.

The answer, according to government authorities, is to weld the expanded-metal sections in place. This, they say, is a good way to prevent their unauthorized removal and resulting wholesale invitations to rats to come in and found a new colony.

you'll WELD or CUT Easier!

with versatile Gasweld ALL-PURPOSE OUTFIT for general work

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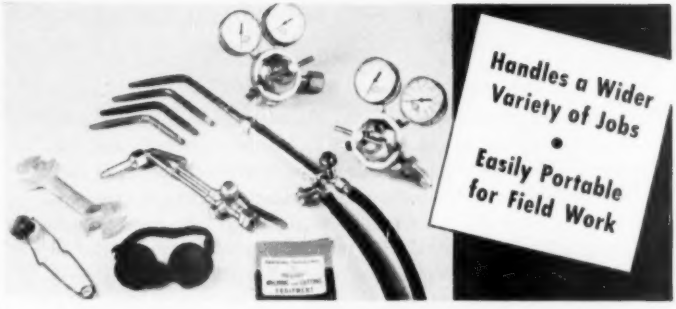


Here's a proved efficiency booster for your welding shop or field crews—wherever a wide variety of welding jobs must be done quickly and *right!* Rugged, heavy duty torch, 17" overall, weighs 24 ounces.

The WC-20 Cutting Attachment multiplies the number and kind of jobs you can handle. All mixers and cutting attachments connect to torch handle with a neoprene seal at the union connection.

Standard Heavy-Duty Cutting Attachment

Head, mixer, tip nut, tip, needle valve, oxygen valve, and lever are the same as in our standard cutting torches. This assures top cutting efficiency and rugged durability in this popular combination outfit.

WG-2544 GENERAL WELDING OUTFIT

Welding Torch is supplied with four gooseneck tips, as selected, from Nos. 1 to 6. Outfit includes: Model RO-44 Oxygen Regulator, Model RA-44 Acetylene Regulator, one pair WM-6 Goggles, two 12½-foot lengths of ¼" hose with connections, one WM-25 Safety Spark Lighter and one RF-77 Combination Wrench. One WC-20 cutting attachment and one tip.

WG-2544—Complete Welding and Cutting Outfit $97.50
Welding Outfit only $75.00

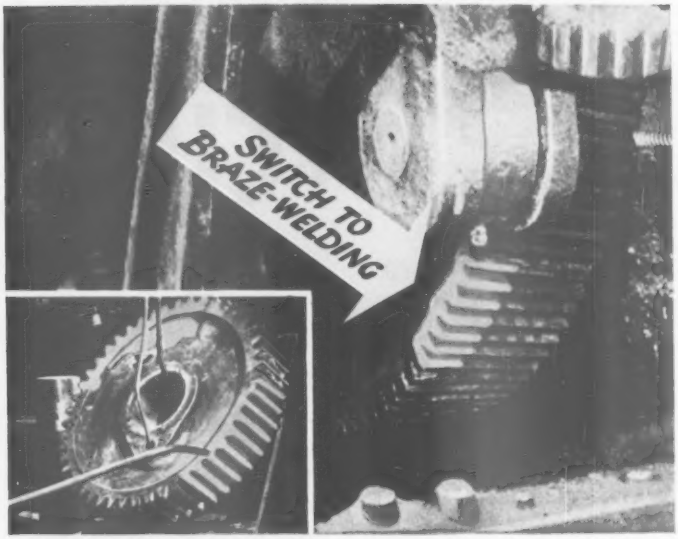
Write for complete catalog of welding and cutting equipment and supplies.

THE LIQUID CARBONIC CORPORATION
Industrial Gas Division
3100 South Kedzie Avenue • Chicago 23, Illinois
Branches and Dealers in Principal Cities

Listed Underwriters Laboratories Inc.

ORDER THROUGH YOUR LOCAL JOBBER OR WRITE US DIRECT

Header timing gear braze welded without dismantling. Insert shows stripped gear teeth which have been built up with Bridgeport's low fuming Manganese Bronze Rod.



CHIPPED, STRIPPED GEARS REPAIRED BY BRAZING WITH BRONZE ROD

Repair of chipped or stripped gear teeth can be turned into a simple job through braze welding with Bridgeport's Low Fuming Manganese Bronze Rod 192.

Often, when the teeth are merely chipped it is possible to braze weld without removing the gear. The built-up tooth can then be shaped with chisel and file. Due to the good strength and fine bearing qualities of copper-base alloys, wear on the repaired part is slight and years of continued service can normally be expected.

If teeth are stripped and most of the tooth form is destroyed, the gear can be removed, built up with bronze and later milled or shaped into form. When braze welding cast iron or steels, it is only necessary to bring the temperature of the parent metal to a cherry red. At this point, braze-weld alloys have excellent tinning action, producing a strong bond.

STANDARD ALLOYS		Welding Methods	Approximate Melting Degrees °F.	°C.
No. 192	Low Fuming Manganese Bronze	Gas	1621	883
No. 191	Manganese Bronze (Navy)	Gas	1630	888
No. 241	Naval Brass	Gas	1630	888
No. 632	Silicon Bronze (3% silicon)	Gas or arc	1882	1028
No. 609	Silicon Bronze (2% silicon)	Gas or arc	1918	1048
No. 548	Nickel Silver	Gas	1675	913

Buy through your distributor.

"Bridgeport" BRASS CO.

BRIDGEPORT BRASS COMPANY

Bridgeport 2, Conn. Established 1865

Mills at Bridgeport, Conn., and Indianapolis, Ind.
In Canada: Noranda Copper and Brass Limited, Montreal

Bronze Welding Rods A PRODUCT OF **BRIDGEPORT BRASS**

RESISTANCE WELDING

(Continued from page 41)

Slope control is considerably less expensive than the additional cost of frequency-changer or metallic-rectifier welders. It is applicable whenever you want the welding advantages of these welders but do not need to obtain any reduction of maximum demand or voltage drop.

Comparative Features

Each of the three means of reducing the kva demand of welders—series capacitors, frequency changers and metallic rectifiers—involves roughly the same total equipment cost. Series capacitors usually provide the most economical means of reducing the kva of existing welders because no change in the welder itself is ordinarily required.

The choice between frequency-changer welders and metallic-rectifier welders is, at present, a matter of some diversity of opinion. Either of these types causes slightly less voltage drop than a comparable series-capacitor application, largely because of the three-phase character of the load. Also, these welders are applicable to widely varying welder throat depth settings or to widely varying amounts of magnetic material projecting into the throat. Such variations that cause changes in the welder reactance would cause wide variations in output if series capacitors were used. (It is not usually practicable to vary the amount of capacitors used with a welder.)

Multiple Welders

A recent trend is toward greater use of multiple-electrode welders, particularly true of the automobile industry. Multiple welders can make a large number of spot welds at once and thus promote rapid production. Each spot, however, is made by a pair of electrodes with an individual transformer. Usually, the transformers are relatively small and of standardized sizes. A single ignitron contactor controls a number of such transformers. Sometimes the transformers are divided into three groups, each group with a contactor and each connected to a different phase of a three-phase line. Fig. 8 illustrates the connections used.

OXYGEN AND ACETYLENE at 10% to 50% Discount

● Harris Automatic Welding Torches represent the biggest advancement in torch design since the original Torch. By means of a thumb controlled lever, the full flame is extinguished when not needed (except for a tiny acetylene pilot light) and relit instantaneously, without need for re-adjustment.

Every time the lever is used, money (oxygen and acetylene) and time are saved. Basically, that's why thousands are in use, especially on production welding work. The original cost of a Harris Automatic is saved many times over during its lifetime.

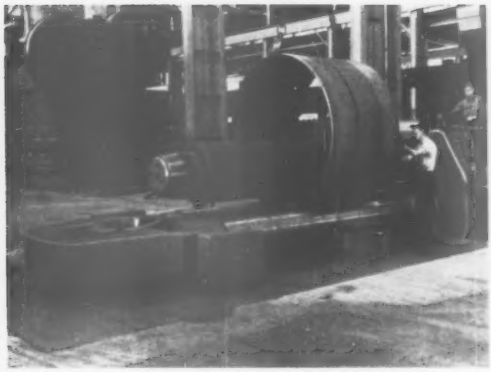
Further, the seven styles and sizes available are unusually good torches, characterized by exceptional flame range from each size of tip, freedom from "popping" and flashback and stand continuous operation under severe conditions.

Why use 1938 (or older) torches under 1950 conditions? Write us, or contact your nearest Harris Distributor for free demonstration.

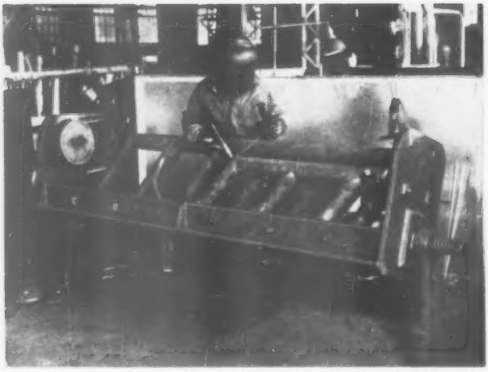
THE HARRIS CALORIFIC COMPANY
CLEVELAND, OHIO

HARRIS

SERVING THE METAL INDUSTRY SINCE 1905



LARGE PLATE bending roll made by Continental Foundry & Machine Co. for its weldment division. It can cold bend 2-in. steel 14 ft wide



Courtesy The Oxweld Railroad Service Co.

REPAIRING cracks in stainless manifolds for Diesels by inert-arc. Pipe is stress-relieved on each side of weld with an oxyacetylene torch

NEWS

Welding Equipment Featured at Continental Foundry

(See left picture)

HEAVY weldments and composite weldments and castings will soon be coming from the new weldment division of the Continental Foundry & Machine Company's East Chicago, Ind., plant. Sturdy construction—the building was formerly a tank armor plant—and high clearance will make weldments of 140 tons practical, say officials. The building is 775 ft long with three bays of 56, 52 and 72 ft widths. A total of 16 cranes serve the weld area.

Purpose of the division is to be a manufacturing shop for engineering or design groups in the chemical, refining or industry fields. In addition to the weldment division, the company has extensive steel casting facilities and machining capacity.

For its own use, Continental built the fourth largest plate bending roll in the world. It is made of a composite weld and cast frame and both forged and cast rolls. It will cold bend a 2-in. steel plate 14 ft wide to an ID of 42 in.

The weld shop also built for its own use a big carriage for submerged-arc welding. The weld can move through a 270 deg arc on a diameter of 20 ft. Other welding equipment includes semi-automatic welding guns, arc welders, gas welding equipment and several 10-ton positioners.

Electronically-operated flame-cutting machines are used in the plate shop to cut steel up to 12-in. thick. Paper templates for the various parts are made in a special lofting section.

Built to order for Continental is the largest hydraulic press brake of its type in the world, a 1,000 tonner. It will take 1-in. plate 16 ft wide between housings and will handle a 20-ft plate on the dies.

Other fabricating equipment for lighter work includes two 600-ton hydraulic presses, a 300-ton press brake, a rotary shear for irregular shapes and numerous punch presses and radial drills.

For cleaning of weldments, there are two large shot blast rooms. For stress relieving, there is a large 12 by 20 by 45 foot pit-type furnace and a battery of 14 car-bottom-type furnaces with 10 by 10 ft openings.

Inspection facilities in an adjacent building include 1,000,000 volt X-ray equipment. To complete the set-up, next to the weldment division Continental has a large machine shop.

* * *

Fix Manifold Leaks by Inert-Arc Welding

(See right picture)

THE Lehigh Valley Railroad is realizing substantial savings in Diesel engine maintenance by repairing cracked manifolds with inert-arc welding. The cracks develop where the stainless steel manifold components were originally joined.

To hold the manifold during repairs the special jig shown above was developed. All lagging is removed from the manifold before it is taken apart to be put in the jig. Parts are placed in the jig so that all are within reach of the weldor.

All cracked places are gone over with an inert-arc torch and a columbium stainless steel filler rod. Local heating shows up previously unseen cracks. After each weld, stresses in the piping are relieved by heating it for three inches on each side of the joint. An oxyacetylene torch is used for this stress relieving, which raises the metal to 1,600 F.

When welding is completed, the holding bands are re-applied and a shipping strip is welded to the flanges. A 1-in. thick layer of new lagging is then put on.

Manifold assembly and jig are removed as a unit, placed on wheels and rolled into a furnace to bake the lagging.

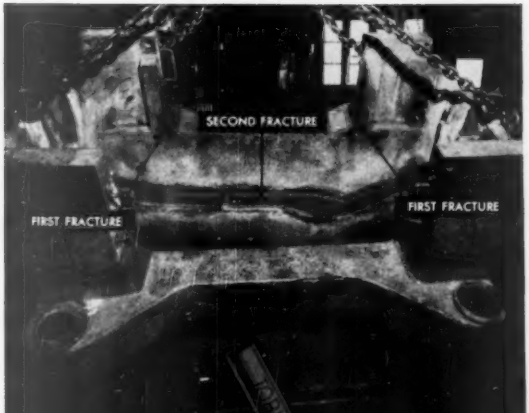
Cost of repair is said to be about $40, not including application of new lagging. Manifold shown has 48 locations that were welded or reworked.

* * *

Flame-Cutting Machine Softens as It Cuts

(See front cover)

A LARGE steel company has adapted a flame-cutting machine to flame-soften silicon steel simultaneously with the machine cutting. Annealing flame follows closely in a fixed position behind the cutting flame. This procedure eliminates manual softening and is said to result in a faster superior annealing job. Silicon steels are among several types that develop high hardness and sometimes cracks along a flame-cut edge. By retarding the cooling rate after flame-cutting, it is said these undesirable conditions can be done away with.



36-foot fracture welded!

An example is the oxyacetylene braze-welding of a 36-foot fracture in this 10-ton blank holder. The casting had fractured before and was braze-welded by the Super Arc Welding Company, Detroit, Mich., using Tobin Bronze. When it broke the second time, a 36-foot fracture, the old weld was not affected. The same company again repaired it . . . naturally with Tobin Bronze.

The bigger the weld, the more you need TOBIN BRONZE

The larger the weld the more chance there is for thermal stresses to create danger of warping or cracking.

So the bigger the job, the more important it is to use Tobin Bronze—which welds at relatively low temperatures. You don't have to pour in so much heat . . . high stresses can't build up.

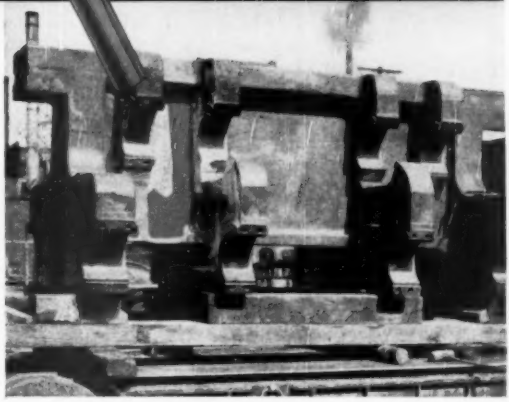
Another Tobin Bronze job!

Here's another Tobin Bronze* repair job by Super Arc . . . welding multiple fractures of an 18-ton crown from a stamping press. Again Tobin Bronze proved its worth for fast, low-cost, dependable welding.

There are ANACONDA Welding Rods for many types of repair and production jobs. ANACONDA Welding Rods are available from distributors throughout the United States. The American Brass Company, Waterbury 20, Connecticut. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

50190

*Reg. U. S. Pat. Off.



You can depend on ANACONDA®

BRONZE WELDING RODS

A LITTLE ROUTINE SERVICE SAVED A LOT OF BRAZING ALLOY

To make this oil burner nozzle lead, EASY-FLO 45 joins an inner steel tube and an outer copper tube to the brass forging at left. Both joints are induction brazed simultaneously, two assemblies at a time in 38 seconds.

It has always been our aim to help every user of our EASY-FLO and SIL-FOS alloys get the fullest benefit of the speed and low cost these low-temperature silver brazing alloys bring to metal joining. So, follow up is routine—and very often our men are able to come up with constructive suggestions.

For example—a user was brazing a small steel tube and a larger copper tube to a brass forging to make the oil burner part shown. He was using two rings of 1/16" EASY-FLO 45 wire, one for each joint—and he was perfectly happy with results.

Looking in on the job our man felt that more alloy was being used than was needed. So he got some of the parts and sent them back to our research lab. There it was found that rings of 1/32" and 3/64" wire for the steel and copper tubes respectively, were ample. Naturally, the change was made—and the saving in cost from this little reduction in the size of alloy wire has mounted to sizable proportions.

CAN YOUR BRAZING COSTS BE CUT?

Whether or not you are now using EASY-FLO and SIL-FOS alloys, we'll be glad to send a field engineer to give you the answer—without obligating you in any way. Just write or call and say when.

For the facts about these alloys in print, write today for Bulletins 12-A and 15.

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"Milburn" Trade Name Goes Back on Market

ONE of the old-time brand names in the gas welding business was that of Alexander Milburn, synonymous for welding torches. The Milburn name goes back on the market again with the incorporation of Alexander Milburn, Inc., 1231-45 Ridgely St., Baltimore 30. The new firm will manufacture and market the Milburn line of oxyacetylene cutting and welding torches, regulators, accessories, gases and carbide lamps. The Milburn name, used in welding circles since 1907, was dropped in 1945, when Milburn equipment was taken over by The Black Mfg. Co., Parkton, Md.

* * *

Second Maintenance Show at Cleveland, Jan. 15-18

WELDING and flame-cutting processes will again be featured at the second Plant Maintenance Show to be held in Cleveland, Jan. 15-18. It is expected that the show will be two or three times bigger than the first one held last year. Some 120 firms have already leased booth space exceeding by 61% the total area used in the first show. Chairman of the show is L. C. Morrow, consulting editor, *Factory Management & Maintenance*, a McGraw-Hill publication. Show information can be obtained from Clapp & Poliak, Inc., 341 Madison Ave., New York City 17.

* * *

Alaska Opens Her First Acetylene Plant

THE first acetylene plant in Alaska has been opened at Fairbanks under the name of the Alaska Chemical Co. It is operated by Walter Buckow, who has run an oxygen plant there since 1941. Capacity of the plant is 120 cylinders of 300 cu ft size each 24-hour day. The plant will serve the Anchorage area as well.

* * *

New York Welding Firm Quits Business

WELDING Engineering Sales Corp., 110 East 42nd St., New York City, have discontinued business as of July 17. Products offered by the company can now be obtained from Welding Sales Corp., 40 Goble St., Newark, N. J.

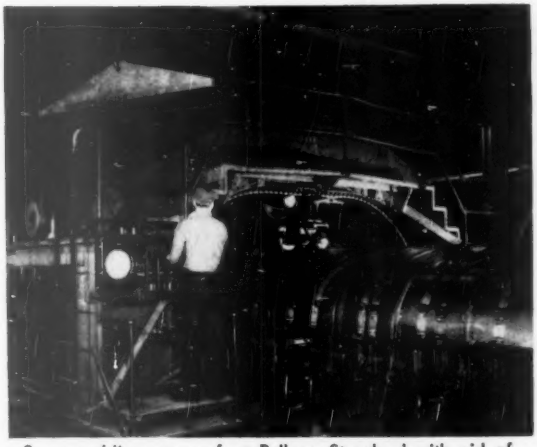
President of Welding Sales Corporation is Harry L. Pierce, formerly a salesman for Welding Engineering Sales Corp.

* * *

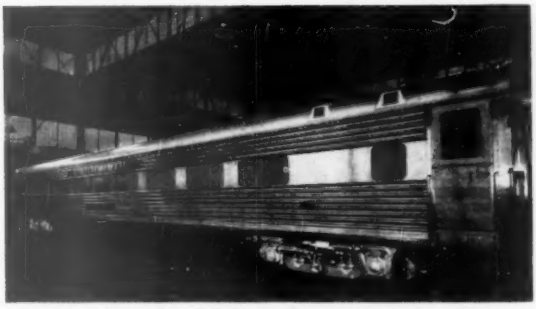
ELECTRONIC CONTROL FOR RESISTANCE WELDING

SPEEDED FABRICATION 100% CUT REJECTS 75%

on cars for G-E MORE POWER TO AMERICA *train*



Seam welding car roof at Pullman-Standard with aid of G-E resistance welding controls.



Completed car for G-E More Power to America exhibit train made for General Electric by Pullman-Standard.

Pullman-Standard Car Manufacturing Company, builder of the cars for the General Electric Apparatus Exhibit train now touring the country, has long been an enthusiastic user of resistance welding. This progressive company was one of the first to realize the savings in weight, increase in strength, and faster production that result from the use of this process. This company has also studied and capitalized on technical improvements over the years.

It's CONTROL That Counts

Pullman-Standard has kept pace with progress in welding control. Today, Pullman-Standard uses modern G-E automatic electronic control which permits very close adjustment of heat and timing. Quality of welds is greatly improved. Compared with earliest control, the equipment now being used speeds fabrication on certain jobs 100%, cuts rejects 75%.

For Your CONTROL—Come To General Electric

Trained G-E engineers will be glad to discuss control problems with you and your resistance welding manufacturer, and from the wide variety of G-E control available can supply the right control for you. ***Apparatus Department, General Electric Company, Schenectady, N. Y.***

SEE "THIS IS RESISTANCE WELDING"—
General Electric's More Power to America full-color movie. Contact your utility, resistance welder manufacturer, or the nearest G-E office.

GENERAL ELECTRIC

645-52C

PROOF OF STRENGTH & CONSISTENCY

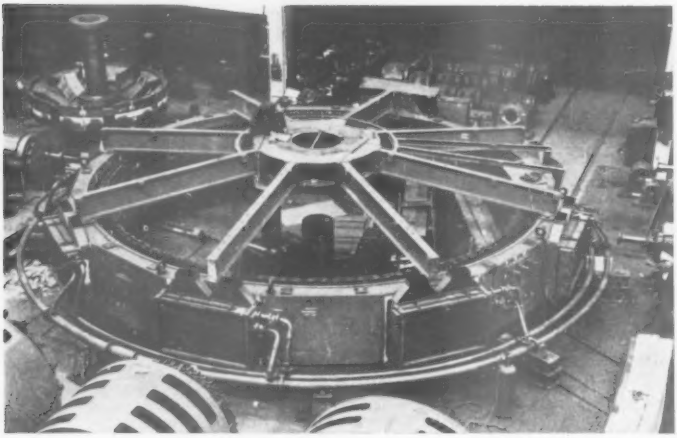
EVERY

MAJOR ENGINEERING INDUSTRY

IS NOW USING

CYC-ARC STUD-WELDING

REG. TRADE MARK



Vertical shaft water turbine driven alternator stator built by Messrs. Metropolitan Vickers Electrical Co., Ltd., Trafford Park, Manchester, England—Cyc-Arc stud welded.

- **RELIABLE**. . . . . Used in Britain's naval dockyards, atomic energy plants, etc.
- **SPEEDY**. . . . . $\frac{3}{4}$" studs welded one a minute, smaller studs, several hundreds an hour dependent on operator skill.
- **COST SAVING**. . Cyc-Arc patented studs standard or tailor-made cost less.
- **VERSATILE**. . . . Stud welds aluminum (without gas), brass, monel, mild and stainless steels.

SEE CYC-ARC STUD WELDERS ON BOOTH 2654
NATIONAL METALS EXPOSITION CHICAGO, OCT. 23-27

CYC-ARC LTD

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STELMAR HOUSE, 27 NEW NORTH RD.
LONDON, N.1, ENGLAND

ENQUIRIES INVITED FROM FIRMS INTERESTED IN MANUFACTURE AND SALE OF CYC-ARC STUD WELDING EQUIPMENT IN THE UNITED STATES UNDER LICENCE

British Aluminum Electrode Has Extruded Coating

ADVANTAGES claimed for a new extruded coating for silicon-aluminum electrodes are smooth running characteristics and all-position welding. It is the first time extruded coatings for aluminum electrodes have been produced in England, according to its manufacturer, Murex Welding Processes, Ltd., Hertfordshire, England.

The slag left by the coating is claimed to be self-lifting in most cases. Even if it does not come off automatically, it will chip easily, say the makers.

The electrodes are recommended for welding wrought alloys and silicon bearing casting alloys. High copper and zinc alloyed aluminum should only be welded with this electrode where some corrosion may be tolerated.

—*McGraw-Hill World News*

* * *

New Induction Heating Used on Nonferrous Metal

NEW technique for the induction heat treating of nonferrous metal strip such as aluminum, brass, copper, magnesium and stainless steel is called "transverse flux induction heating."

In this method, magnetic flux is directed perpendicular to the surface of the strip instead of along its length as in conventional radio-frequency induction heating, according to R. M. Baker, Westinghouse Electric Corp., Baltimore, Md.

It is accomplished by passing strip between two opposing laminated pole structures. The field coils, supplied with alternating current, are oppositely polarized so that flux is forced through the strip. Frequencies of from 60 to 10,000 cycles per second are used with this system, depending on the thickness and resistivity of the strip.

* * *

Scotch Farmers Weld Own Farm Equipment

Growing numbers of farmers in Scotland and the Western Islands are cooperatively buying welders to repair their farming tools. Though the trend is more evident on large farms, smaller farmers are grouping for this purpose also.

Repair firms specializing in farm work send welding crews into isolated areas and to outlying islands. Sometimes the welding shop is part of a more comprehensive repair setup including a machine shop and a blacksmith shop.

—*McGraw-Hill World News*

YOU CAN BE **SURE**.. IF IT'S
Westinghouse

NEW D-C WELDER
SAVES $126 A YEAR IN POWER COSTS!

★ **NO-LOAD LOSS OF ONLY 500 WATTS...** compared to 2480-3600 watts on a conventional motor-generator welder.

★ **ENDS WELDER NOISE!** Lightweight, quiet selenium rectifier replaces old noisy motor generator.

★ **SIMPLICITY SLASHES OPERATING COSTS.** The new Westinghouse has only 3 basic elements ... transformer, reactor and rectifier. Saves motor and generator maintenance costs.

★ **SMOOTHER WELDING...** Less arc blow ... easier arc striking ... better weld quality.

FREE TRIAL!

We'll arrange DEMONSTRATION OR TRIAL INSTALLATION of the new Westinghouse D-C Welder at no cost to you. Write today. Westinghouse Electric Corporation, Dept. DC-15, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-21596

Westinghouse
D-C Welders

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FAST START!
FOR THE BEST RESULTS AT LOWEST COST
IN WELDING
IN CUTTING
IN SAFETY EQUIPMENT
BEST BUY BURDOX

Time lost in preparation, in looking for tools, in makeshift arrangements costs you money! You can't expect your men to do good work without good tools and accessories. Get the best in welding, cutting and safety equipment without paying premium prices by specifying BURDOX. Typical of the outstanding value and high quality of the entire BURDOX line are the products shown below. Made by welding men for welding men they reduce lost time, improve performances. Write for free catalog today and start saving with BURDOX at once!

CYLINDER TRUCKS DELUXE MODEL—The greatest cylinder truck value you've ever seen! Streamlined one-piece safety handle. Streamlined tool tray and rack. Bicycle type wheels with solid rubber tires. All welded construction. Chain holds cylinders securely.

JUNIOR MODEL—Ideal for handling small size cylinder! All welded tubular construction, mechanical rubber tires, oilless bronze bearings. Rolls like a charm. Adjustable telescoping tubular device holds cylinders securely.

EYEGARD HELMETS—Made to give the welder extra comfort, extra protection. Exclusive adjustable type headgear for "featherweight" fit.

CYLINDER CONNECTIONS—All brass, made to close tolerances. Guaranteed against mechanical defects. Finest made, yet cost no more.

TRIP-L-ITE FLINT LIGHTERS—Lasts three times as long as ordinary lighters. Produces a hot, fat spark every time. Works easy. Insures instantaneous lighting.

EXTRA-FLEX CABLE—Extra-flexible, extra-resistance to abrasion, oil and water because of special construction. Millions of feet sold because of performance and price.

THE BURDOX LINE INCLUDES:
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THE BURDETT OXYGEN COMPANY
3302 LAKESIDE AVENUE GENERAL ELECTRIC CLEVELAND 14, OHIO
Arc-welding Distributor
AKRON • MANSFIELD • CINCINNATI • COLUMBUS

British Develop Tube Rectifier for D-C Welder

LITTLE maintenance and low fire risk are claimed for a new tube rectifier d-c welder made by the British firm, Hackbridge and Hewittic Electric Company, Ltd. The welder has no bearings, regulating switches, brushes or commutator.

Current adjustment ranges from 20 amp at 19 volts to 80 amps at 25 volts. Open-circuit voltage stays constant at about 80 volts. Polarity of the electrode may be either negative or positive at the switchover of a simple link on the welder. Since there is no mechanical or magnetic inertia, arc current and voltage follow quickly any change in arc condition and length.

—*McGraw-Hill World News*

* * *

French Weld Piping by Induction Heating

A NEW automatic machine that welds small piping and tubing by utilizing induction heating is reported by the SOCIETE DES ECHAFAUDAGES TUBULAIRES BURTON, S. A., Saint Quentin, France. Coils are located only at the joint to be made—the heated zone is very small. Welded piping made by this process has withstood air pressures of 4,500 psi, it is claimed.

Elimination of cleaning operations on pipe ends is claimed with the new process. Thickness deviations in piping are not critical. Regulation of the welder includes the use of photoelectric cells and thyratron tubes. Power for the welder is produced by 200 kw generators supplying three-phase current.

* * *

Welding Society Officers Elected at Hamilton, Ont.

TAKING office this fall in the Hamilton, Ont., section of the Canadian Welding Society will be: chairman, Charles H. Clark, International Harvester Co.; vice-chairman, R. R. Kottmeier, Canadian Liquid Air Co.; second vice-chairman, B. W. McCarthy, Waterous Ltd., Brantford, Ont.; secretary, S. P. Lockhart, Robertson-Irwin Ltd.; treasurer, M. S. Mark, Mark's Welding Service; program chairman, A. R. Jacobs, Lincoln Electric Co.; publicity chairman, F. J. Butters, Canadian General Electric Co.; membership chairman, W. R. Rowbotham, International Harvester Co.; past chairman, J. R. Walker, Steel Company of Canada Ltd., and reception committee, A. Vila, W. Villa and W. Burchell.

PAGE *Welding* ELECTRODES

Page-Allegheny *Stainless Steel*

AC or DC

ARC
—stable even at very low amperage

SLAG
—clean, easily removed

COATING
—resists cracking down to very short stubs

SELECTION
—complete line for welding every type of stainless

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—prompt from warehouses in Chicago, Denver, Houston, Philadelphia, San Francisco and the factory at Monessen, Pa.

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Designed, tested and proved for high pressures and severe service.

Packing may be replaced with cylinder under pressure if necessary.

Fuse plug and bursting disc provide positive safeguard.

Bronze stem furnished as standard, also available with monel stem on special order.

for ACETYLENE

Cadmium-plated steel stem with monel tip resists rust and wear.

Ball-nose seat construction assures positive shut-off.

for CARBON DIOXIDE

Available with diaphragm-type or packed-type construction.

Compact rugged design for use with high pressures.

Equipped with bursting disc safety device.

*Reg. U. S. Pat. Off.

The BASTIAN-BLESSING Co.
4201 West Peterson Ave. Chicago 30, Illinois

PIONEER AND LEADER IN THE DESIGN AND MANUFACTURE OF PRECISION EQUIPMENT FOR USING AND CONTROLLING HIGH PRESSURE GASES

"Cyc-Arc" Stud Welding To Be Shown in Chicago

DEMONSTRATIONS of the "Cyc-Arc" stud welding process, a British development, will be staged in the United States and Canada during October and November. Manufacturing and sales rights to the stud welding guns, which weld aluminum, brass, Monel and steel, will be offered to business firms in both countries.

Principal location of the demonstration will be at Chicago's Knickerbocker Hotel, Oct. 16 to 31. Arrangements will be in charge of R. W. Taylor, Cyc-Arc sales manager. The new process will also be displayed at the National Metal Show, Oct. 23-27, at Chicago's International Amphitheatre.

Other displays of the stud welding guns will be held in Toronto and Montreal after the Metal Show.

—*McGraw-Hill World News*

* * *

Like to Learn to Speak Well?

A PRACTICAL, pocket-size manual, "Speaking Can Be Easy" has been written especially for use by engineers. Text is written by experienced engineering speakers and prepared by the Committee on Relations with Industry of the American Society for Engineering Education.

Cartoons on each pair of pages emphasize major points discussed. The entire manual can be read through in 30 minutes and the most important points can be glanced at in five minutes. Check lists for both the speaker and the meeting chairman will help them execute their jobs efficiently.

The special committee preparing this manual consisted of: Erhardt C. Koerper, research consultant, A. O. Smith Corp., editor; S. D. Kirkpatrick, vice-president, McGraw-Hill Publishing Co.; J. L. Singleton, vice-president, Allis Chalmers Mfg. Co.; L. J. Fletcher, director of training and community relations, Caterpillar Tractor Co.; Westbrook Steele, director, Institute of Paper Chemistry and Ward Delaney, president, Institute of Textile Technology.

Copies can be obtained at 50c each from the Engineers' Council for Professional Development, 29 West 39th St., New York City 18.

* * *

New Tube Mill Added by Babcock & Wilcox

A new tube mill, the third such unit at The Babcock & Wilcox Tube Company's Alliance works, recently went into operation. It makes tubing of ½-in. OD and larger with wall thicknesses 20 gage and heavier.

P&H helps you

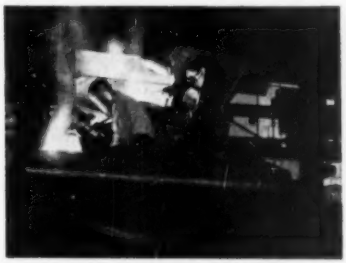
cut fabricating costs on "hard-to-weld" steels •

Have superior physical qualities — ideal for welding heavy sections that must withstand severe shock and abuse.

Low-Hydrogen Electrodes

- ***For problem steels:*** High carbon, high sulphur, cold-rolled, alloy... *70LA.*
- ***For steel castings repair;*** matches analysis and heat-treating properties of Grade B castings... *P&H25C.*
- ***For welding nickel-alloy steels;*** gives high impact resistance at low temperatures... *75LP.*
- ***For chrome-moly steels*** (1% Cr., ½% Mo.) used in power piping ... *80LE.*
- ***For chrome-moly steels*** (2% Cr., 1% Mo.) used in power piping ... *90LE.*
- ***To match heat-treating properties of SAE 1040*** and like steels. Also for steel-castings repair... *P&H40C.*
- ***For welding high hardenable steels.*** Also steel castings repair... *AW2B.*
- ***For repair welding Grade C castings*** and steels of similar composition... *P&H #7.*
- ***Comparable to SAE 8630 steel***...excellent heat-treating and flame-hardening characteristics... *90LH #2.*
- ***For welding high hardenable steels*** without preheat such as re-rolled rail stock... *P&H #12.*
- ***For aircraft and similar steels*** . . . has wide range of properties under heat treatments... *P&H #21.*

Withstand high amperages and have high deposition rate. Operators burn more rod per hour, weld faster at lower costs.



These rods operate with stable arc on AC or reverse-polarity DC. Other money-saving features are: Elimination of underbead cracking. Low hydrogen content for successful enameling. Little or no preheating. Minimum spatter. Excellent appearance of weld... freedom from surface holes. Order from your P&H representative or local P&H distributor. Send coupon for detailed information.

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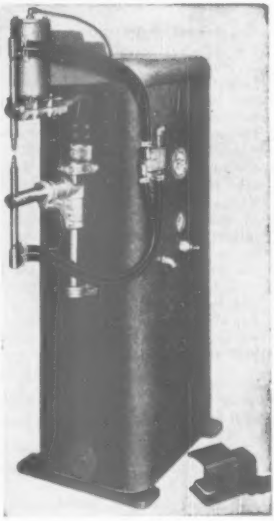
Banner 15 KVA SPOT WELDER

- High Speed—Quality Production
- Simple—Rugged Construction
- Easy Maintenance

Typical of the many advantages of Banner Spot Welders is the unique head construction of the unit illustrated. A rugged aluminum-bronze piston, with long bearing surface, is equipped with 3 cast iron piston rings which reduce friction to a minimum.

Special steel guide through the cylinder wall and piston prevents side play of the head—thus assuring clear uniform welds.

These air-operated, 10-15-20-30 KVA Spot and Projection Welders have many other distinctive features illustrated in booklet, "Banner Press Type Welders"



BM Co
BANNER MANUFACTURING COMPANY
4936 NORTH 29TH STREET • MILWAUKEE 9, WISCONSIN

New Type Joints for Cold Welding

FURTHER investigations into cold pressure welding by The General Electric Co., Ltd., of England, show that good joints may be made in expanded aluminum screening and widely varying thicknesses of similar metals. (See THE WELDING ENGINEER, Feb., 1950, page 17). According to *The Machinist*, satisfactory welds can be achieved with copper and aluminum in thickness rato of 20 to 1. Welds have also been made between two pieces of solid metal separated by wire gauze, such as on the edges of insect-proof screens.

—*McGraw-Hill World News*

* * *

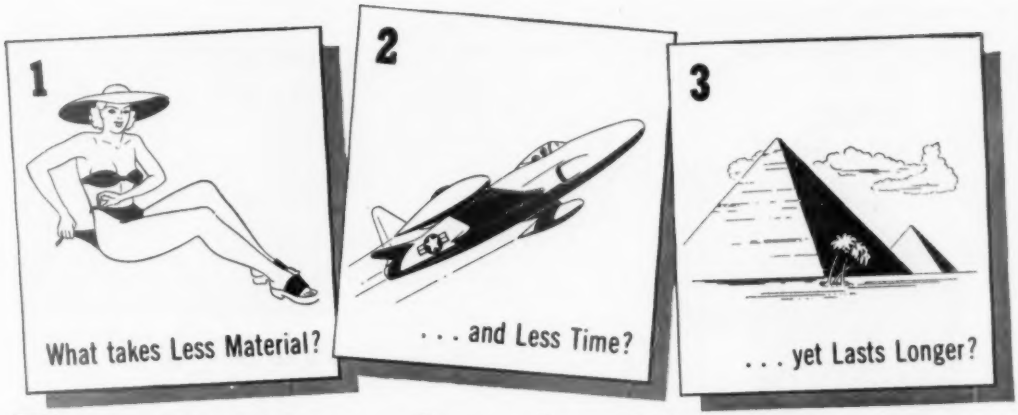
Vancouver Welding Men Choose Local Officers

THE NEW leaders of the Vancouver, B. C., section of the Canadian Welding Society for 1950-51 are: chairman, Ted Taylor, Western Bridge and Steel Fabricators Ltd.; vice-chairman, Dave Nelson, Vancouver Engineering Works Ltd.; treasurer, Eric Dunnett, Canadian Sumner Iron Ltd.; secretary, J. Lundie, Paragon Supplies Ltd.; past chairman, J. H. McNaughton, Dominion Bridge Co.; membership chairman, Harry Dally, Dominion Bridge Co. Ltd. and William Somerville, Heaps Waterous Ltd., New Westminster, B. C.; publicity chairman, M. L. Smith, Canadian Liquid Air Co.; program chairman, R. W. McAlpine, Lincoln Electric Co.

* * *

Courtesy Weldit, Inc.

PRETTY PACKAGE of more than 200 welding torches sent to new plant of DeSoto Division of Chrysler Corp., Detroit. Plant has standardized on this torch and "gas-saver" equipment for oxyacetylene welding, brazing



Three questions about hard facing with but one answer–

COLMONOY SPRAYWELD PROCESS*

*A process of *welding* sprayed metal

1. *Less Material* is used with the Sprayweld process than with hand welding because the thickness of the overlay is easily controlled to within .010".

2. *Less Time* is required to spray and fuse than to laboriously apply the overlay with a rod. Most time is saved in finishing the work, the Sprayweld application being much closer to finish dimensions than hand welding.

3. A Sprayweld surface *Lasts Longer* because it is dense and smooth, with no pinholes or porosity. Colmonoy alloys, used in Spraywelding, are highly abrasion and corrosion resistant, and give up to 25 times longer life, than original equipment.

SPRAYWELDER IN ACTION

Here the spraywelding of an 18.8 stainless steel autoclave shaft is in progress. Colmonoy No. 6, the alloy being sprayed, has great resistance against the wear and corrosion caused by gases under pressure (encountered in the synthesis of ammonia). This shaft will last 12 times longer than would an unfaced one.

ORDER FROM YOUR LOCAL JOBBER

WALL COLMONOY
CORPORATION
HARD FACING ALLOYS
19345 JOHN R STREET DETROIT 3, MICHIGAN

Colmonoy is a complete line of hard facing alloys. They have various properties and come in many forms: rod, wire, powder, paste and castings. Powdered Colmonoy 4, 5, and 6, all nickel base alloys, can be used in the Colmonoy Spraywelder.

The Colmonoy Spraywelder is the powder metallizing gun, shown below. It provides a simple, low-priced method of applying hard facing alloys to withstand corrosion and abrasion.

This process we call Spraywelding. You *spray* the Colmonoy alloy on, then *weld* it by bringing the overlay to a fusing temperature. Thus Colmonoy Spraywelding combines the advantages of two familiar processes: the *smooth application* of metallizing, with the true *molecular bonding* of welding.

Many *worn* parts, commonly discarded, may now be hard faced the Sprayweld way.

Many *new* parts, commonly made of expensive, hardened alloy steel, may now be made of mild steel and Spraywelded with Colmonoy.

The process is essentially three steps:

- Preparing the surface by grit blasting or by rough threading.
- Spraying the surface with the Colmonoy Spraywelder or your own metallizing equipment (using Colmonoy Spray Weld wire).
- The fusion of the overlay to the base metal by using an oxy-acetylene torch, or controlled atmosphere furnace.

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19345 John R Street • Detroit 3 • Michigan
Please send me information about Colmonoy hard facing alloys.

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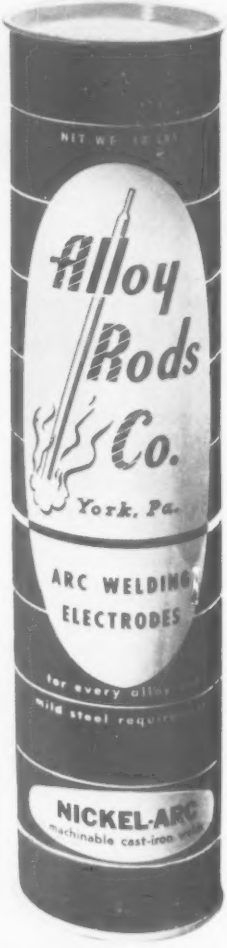
STEEL CONTAINER

Moisture, dirt and grease proof. Easy to stock convenient 10 lb. size.



NICKEL-ARC
CAST IRON
ARC WELDING
ELECTRODES

Save the cost of complete new castings or cast iron parts by repairing with Nickel-Arc. Machinable welds—no preheating or special techniques required. Ask for Bulletin #2218. Alloy Rods Company, York, Penna.

5 Tons of Dynamite Blast Pipe-Line River Crossing

RECENT laying of a pipe line by the Oman Construction Company entailed blasting of a 650-ft trench across the center section of the 1,900 ft wide Tennessee River. A barge-mounted dragline was able to dig a four-foot ditch in the river bottom from both banks to the tough packed-mud and rock center section. Here, because of the soil and a 30-ft depth only a two foot trench was possible.

To deepen the ditch, 25-lb rolls of 80% high velocity river dynamite were tied to a 1½-in. cable and winched into the trench. Next, a diver checked the charge, which totaled 10,000 lb.

Water shot 200 ft high when the explosive was set off. A quick dragline trip dredged out the loose mud and rock in the deepened channel.

Then, 400-ft lengths of 16-in. river pipe were bullheaded and winched into the river. The lengths had been welded from 50-ft pipes before blasting began. In addition to welding the ½-in. thick river pipe, special preparations had to be made to protect it after laying. Besides the conventional cleaning and priming, it got two coats of enamel dope, two coats of felt wrapping and a ½-in. asphalt-impregnated wire-formed felt lagging. Cast iron river weights were clamped on at 35-ft intervals.

"Caterpillar" Diesel tractors were versatile tools in the crossing. Equipped with sidebooms they were used for welding, doping and wrapping procedures on the north bank. At the same time, on the south bank, another tractor equipped with a winch teamed up with a truck to pull the pipe into the river ditch.

The river crossing was almost perfectly coordinated with the overland pipe line laying operations. It was finished when the pioneering crew was just three miles distant.

Location of this crossing is on the Oak Ridge, Knoxville, Athens section of a new East Tennessee Natural Gas Company loop.

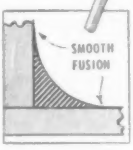
* * *

Burdette Oxygen Opens Fourth Ohio Branch

The Burdett Oxygen Company, Cleveland has opened its fourth Ohio branch store and warehouse at Columbus. The new outlet at the state capital will handle oxygen, acetylene and other gases, plus a complete stock of gas and arc welding supplies. John Feezer is manager of the store.

* * *

HOBART "12"
(E-6012)
electrode



The above illustration is a cross section of a vertical down bead showing the smooth fusion line at edge of weld.

Uniform welding characteristics enable the welder to weld to top of lap joint without burnback or leaving ragged edges.

Try 'em FREE!
See for yourself the many advantages of the HOBART "12" electrodes

Today's best buy for all-purpose welding.

THEY COST NO MORE: The Hobart 12 is a premium electrode in QUALITY and PERFORMANCE but at no premium cost – they cost no more than other E-6012 electrodes. The more actual weld deposit, the increased production, less clean-up time gained by using Hobart 12 really means they cost less.

THEY GO FURTHER: Tests prove that there is more actual weld metal per electrode when using Hobart 12 than other E-6012 electrodes due to less spatter and less stub loss even when using higher than normal welding currents.

GENERAL PURPOSE WELDING: Hobart 12 is ideal for the wide range of jobs that are found in every garage, job shop or industrial manufacturer. Many of the country's largest fabricators of Tanks, Automobile Frames, Agricultural Implements, Structural Fabricators – have standardized on Hobart 12.

In addition to the 12, Hobart carries a complete line of electrodes, including Mild Steel, Hardfacing, Cast Iron, Stainless, etc. Write for complete electrode catalog.

Without cost or obligation, we'll send you samples for your trial. Write today.

HOBART BROTHERS COMPANY
Box U-901, Troy, Ohio
One of the world's largest builders of arc welders

Simplify all your welding by using **HOBART ELECTRODES**

MAKE BETTER OPERATORS!

Write for CATALOG 48

Gives details on full line of K-G Welding Torches, Cutting Torches, Tips, Regulators, Adaptors, etc.

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JUST a few minutes welding or cutting with K-G equipment and your operators know they have *real* tools . . . fast-working, well-balanced, accurate, easily controlled. You can't beat the combination of skilled operators, plus fine tools, to turn out better, faster gas welding and cutting.

K-G Welding Torches, Cutting Torches and Gas Regulators are scientifically designed and built on the experience of 35 years of specialization in the manufacture of gas welding and cutting equipment. Every proven advance in metallurgy has been adopted to insure durable service. And to assure safety, all items carry the Underwriters' Laboratories approval.

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SPECIAL FLUX

FOR...

GENERAL BRAZING

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NO NEED TO STOCK
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WHICH DETERIORATE
WHEN ONE CAN OF

"York's 77" 3 in 1 FLUX

MEETS ALL YOUR NEEDS

Make full use of the 4 famous features of "York's 77".

You will save money, save labor, and save time.

1 Fear of overheating can be forgotten.

2 Cleaning and grinding are unnecessary, because "York's 77" penetrates through grease, oxides, etc.

3 Chipping is unnecessary, because a satisfactory bond can be obtained on oxidized surfaces.

4 Deteriorated cast iron can always be welded successfully with "York's 77".

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No. 335 Welders Coverspec Goggles

"CHAMPION"

EYEGARDS

with 10 way ventilation

NEXT BEST THING TO YOUR EYES

Giving your men the finest in eye protection doesn't mean you have to pay premium prices. Get Eyegard goggles and save the difference! They're the goggles that provide greater comfort because the lightweight plastic frame is molded to form-fit the face . . . greater protection because the goggles are impact-resisting . . . greater ventilation through three large vents at side of cup and seven additional vents around the lenses. Cool and fog-free. With all their exclusive features, they cost no more than ordinary goggles. Get Eyegard "Champions" on next order.

Write for free catalog of Eyegard Equipment . . . it will save you money!

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DIVISION OF THE BURDETT OXYGEN COMPANY • CLEVELAND, OHIO

Test Stress Corrosion of Magnesium Alloys

MAGNESIUM alloys are easily weldable, machinable and have a high strength-to-weight ratio. On the debit side, however, stressed magnesium parts sometimes corrode badly in certain atmospheres. To investigate this tendency with regard to aircraft structures, H. L. Logan and H. Hessing of the Bureau of Standards at the request of the Navy, made extensive tests.

Magnesium-sheet materials tested were the M1, AZ31X, AZ51X, AZ61X and a clad alloy in which a core of AZ31X sheet was sandwiched between two thin layers of M1 alloy. Extrusions studied were the ZK-60, AZ61X, AZ80X and AZ80X-HTA.

Test specimens under tension were exposed to the weather at the Bureau of Standards in Washington and on a platform built over tidewater at Hampton Roads, Va. Unstressed specimens were subjected to the same atmosphere at the same time.

Results showed that susceptibility to corrosion increased with aluminum content up to 6.5% aluminum. Specimens stressed and exposed at the Washington, D. C., site failed faster than those in a marine atmosphere. On the other hand, losses in tensile strength to unstressed specimens at the Washington site were small.

Most resistant to stress corrosion is the M1-clad AZ31X alloy. Specimens of this alloy were stressed to 30,000 psi (90% of yield strength) for 500 days without failure. Among the bare alloys the M1 sheet and the ZK-60 extruded material were best in stress-corrosion resistance.

For more details, see Stress Corrosion of Wrought Magnesium Alloys, by H. L. Logan and H. Hessing. J. Research NBS 44, 233 (1950) RP2071.

* * *

Maryland Oxygen Becomes National Cylinder Gas

THE business of the Maryland Oxygen Co., 1700 So. Newkirk St., Baltimore 24, was assumed by National Cylinder Gas Co., on Aug. 1. There will be no change in personnel or policies. The company has been a subsidiary of NCG for many years.

* * *

1950 Electronic Conference at Chicago, Sept. 25-27

A HEAVY slant toward industrial electronic applications features the program of the 1950 National Electronic Conference to be held Sept. 25-27 at the Edgewater Beach Hotel, Chicago.

This new WELDING DESIGN MANUAL

EUTECTIC

yours . . . FREE for the asking!

To assist you in your re-tooling problems . . . or to help you analyze your present welding methods so that you may enjoy maximum speed, efficiency, and economy in many of YOUR production problems, EUTECTIC offers — FREE of charge and without obligation — this new, packed-full-of-information book!

Over 40 pages of helpful data covering basic and advanced welding techniques and designs used in fabricating and assembly. Profusely illustrated with scores of application drawings, weld diagrams, how-to-do-it sketches, etc. In addition, you will find page after page of tables containing latest information on melting temperatures, tensile strengths, corrosion factors, nomenclature, alloy recommendations, etc. Convenient digest size.

This just-off-the-press book is "must" reading for anyone engaged in defense production and design, and will certainly be time profitably spent for any production man.

THIS PARTIAL LIST OF CONTENTS SHOWS THE WEALTH OF VALUABLE INFORMATION IN THIS HANDY MANUAL— ***yours FREE***

Definition of Terms • Technology • Temperatures of application • Joining Methods: Torch Joining; Arc Joining; Induction Joining; Furnace Joining; Inert Arc Joining • Recommendations of Types of Joint and Heating Methods • Design Information: Square Butt Joint; Lap Joint; Flange Joint; Beveled Butt Joint; Fillet Weld; Overlay • Fluxing and Removal of Flux • Inspection and Control • Heat-treating of Welded Parts, and Welding of Heat-treated Parts.

—AND SCORES MORE . . . INCLUDING sketches and data on welding alloys for use with: cast iron, all steels, stainless steel, copper, brass, bronze, nickel and its alloys, magnesium, aluminum, hard and machinable overlays, etc., etc., etc!

Re-Tooling Now? . . . or Later??

Some firms have already started their re-tooling operations, some are still in the planning stage. Regardless of which stage YOU are in, it will pay you to start checking up NOW on the latest welding techniques and on the many ways you can speed productive output while you cut production costs through a revision of *your* welding designs and techniques. *Send for your FREE copy of this helpful manual TODAY.*

SEE HOW 10 years of EUTECTIC'S continuing welding research have evolved radically new metal joining techniques and designs.
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WHICH of your present designs can be altered to take advantage of these new production methods.

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This new manual of yours sounds like a very helpful book. Send me a FREE copy with the understanding that there will be no cost or obligation now or later.

Signed _____

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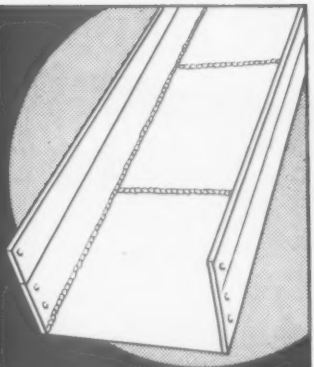

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Worn CHUTES
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Hot Rolled Plates

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MANGANAL workhardens under impact and abrasion to 550 Brinell . . . has tensile strength up to 150,000 p.s.i.

WELD HOT ROLLED PLATES in place with MANGANAL Special Tite-Kote Electrodes for best results.

AVAILABLE IN ¼" to 1" thickness, 48" × 144" . . . can be punched or sheared hot or cold.

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AWS Section Activities Told at Tulsa Meeting

LAST year's successes and disappointments of local sections in the mid-southern district of The American Welding Society were related at a district meeting in Tulsa, July 15. Ray L. Townsend, district vice-president was in charge. The meeting hall was provided by The National Tank Co.

National officers in attendance were O. B. J. Fraser, president, and Howard N. Sims, director. Allen E. Wisler, district vice-president elect, was also present.

Among section problems discussed were low attendance, membership dues, dinner meetings and educational programs. It was agreed that dinner meetings seemed to step up attendance. Live demonstrations of welding were also boosters.

Welding men reporting on their respective section activities were: John P. Viglini, Dallas; E. F. Jacobi, Denver, Colo.; Larry F. Megow, Houston; J. M. Payne, Kansas City; Jerry Fiegener, Oklahoma City; Dewitt T. Harrelson, St. Louis; James B. Davis, Tulsa and Paul Carter, Wichita, Kansas.

Following the meeting the officials and delegates were taken on a visit through National Tank Co. Later, dinner and entertainment were given at the Indian Hills Country Club.

* * *

IAA 1951 Meeting Set for Montreal in May

THE 1951 convention of the International Acetylene Association will be held in Montreal, Canada, on May 21-23. Plans for the convention will be discussed at a meeting of the program committee at Wellesley Island, Alexandria Bay, N. Y., Sept. 11.

* * *

New Distributors

Chicago Eye Shield Co., Chicago: Guardian Safety Equipment Co., Atlanta, Ga., will handle the Cesco line of head and eye protective gear. Office will be in charge of John M. Walter.

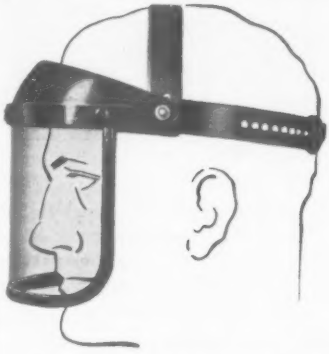
* * *

Stewart Sales Co., Minneapolis, Minn.: United States Steel Supply Co. will handle the "Alhart Pattern Developer" for patterns having round, oval or rectangular openings.

* * *

Handy and Harman, Newark, N. J.: Air Reduction Sales Co., will handle 5 oz. packets of silver brazing alloy.

STOP FLYING PARTICLES
MOLTEN METAL LIGHT GLARE
DUST WOOD CHIPS SAWDUST
METAL FRAGMENTS *with*



JACKSON
TYPE J-1
EYESHIELD
PROTECTS EYES AND FACE
IN METAL FINISHING METAL POURING
SPOT AND FLASH WELDING WOODWORKING
AND MANY OTHER OPERATIONS

Few ounces of weight give pounds of protection against many industrial hazards.

Jackson J-1 Eyeshields weigh only 5½ ounces, have saved thousands from serious injuries and countless expense. They help to keep production flowing in many industries.

Available in Clear and in Three Shades of Green, Visors are 4, 6, and 8 inches deep

JACKSON
PRODUCTS
WARREN · MICHIGAN

SOLD EVERYWHERE BY SAFETY SUPPLY DEALERS AND WELDING SUPPLY HOUSES

For FRUEHAUF Trailers... It's MUREX, too!

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E. Chicago, Ind.
Minneapolis
So. San Francisco

MUREX ELECTRODES and M & T a-c welders work together to provide economical welding in the production of Fruehauf trailers. High speed, specially designed Murex electrodes for joining light sections and sheet metal provide more feet of welding per hour. Efficient M & T a-c transformers reduce idling current to a minimum; assure lower power costs.

Prominent fabricators of every type of welded equipment, both heavy and light, rely on Murex for highest welding quality and welding economy. Let us show you what Murex can do. As a starter, write today for descriptive bulletins on electrodes, machines, accessories.

CAM-LOK

Arc Welding Cable Connections

On the job tested, and now being used by scores of plants in the United States and Canada.

A POSITIVE BINDING LOCK that will give a constant contact; yet, a simple twist of the wrist, and it will come apart.

Write for descriptive circular, and quantity prices.

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CAM-LOK CONNECTOR COMPANY

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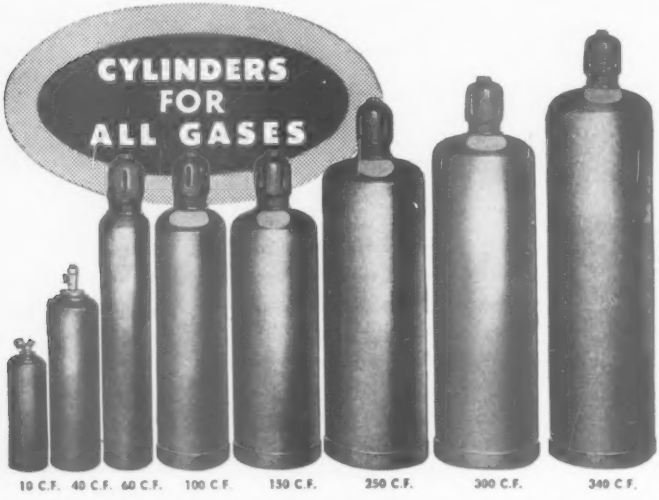

INDEPENDENT Acetylene Cylinders take from 5 to 10% more gas. Uniformity of monolithic filler insures even distribution of acetone. Storage cylinders available in 12' and 20' lengths, of 850 and 1,500 cu. ft. capacities.

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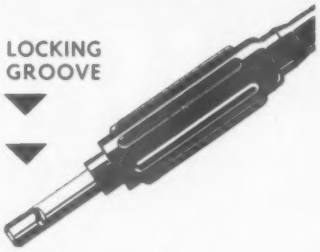
NEW PRODUCTS

(Continued from page 46)



Pin and Socket Lock on Cable Connector

NEW locking arrangement on connectors for welding cable is said to permit use of shorter, easily handled sections on welding jobs. The "push-lock" pin and socket arrangement positively prevents accidental disengagement, yet allows easy connects and disconnects.

Close fitting face segments seal the contacts in resilient Neoprene rubber when connection is made.

Connectors are available for standard welding cable sizes as complete assemblies or molded to 36-in. leads for attaching to the customer's cable.

DEPT. W3, MINES EQUIPMENT DIV., JOY MFG. CO., Henry W. Oliver Bldg., Pittsburgh 22.

Welded Trailer Hitch Has Chrome Cover

THE "Universal Husky Hitch" for welded attachment to all makes of cars is disguised and streamlined by a chrome-plated cover when not in use. The hitch is designed to be welded to a 3-in. channel such as is commonly used in trailer hitch arrangements. It is made of cast steel and has a solid steel hitch ball that is interchangeable. The cover fastens over the ball.

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Withstands high temperatures, heavy wear, expansion, and contraction—can be flowed in at 620° F. Use with any kind of heat.

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Contains Bronze Spelter—specially prepared for brazing Malleable and Cast Iron, Steel, Brass, Bronze, and Copper. Uses lower heat—less expansion and preheating—removes oxides—flows freely. Leaves no glazed surface—easily machined and finished.

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About People

ARTHUR B. TESMEN has joined Tempil Corp., New York City, as a sales engineer. He was formerly with North American Philips Co., Inc., in charge of sales-service, promotion and development of contact electrodes and other welding products. He has also worked for Crucible Steel Co. of America and the Philadelphia Navy Yard.

* * *

W. H. WINANS has been elected vice-president—industrial relations, Union Carbide and Carbon Corp.

* * *

CHARLES H. GALLAWAY, sales manager of the safety products division, American Optical Co., Southbridge, Mass., was elected president of The Industrial Safety Equipment Association at the association's annual meeting.

* * *

A. W. SAWYER has been appointed assistant to the vice-president of The Lincoln Electric Co., Cleveland. He was formerly in charge of development and promotion of welding instruction aids. His job will include handling government bids and contracts and Lincoln's educational activities. He is a member of the American Welding Society.

* * *

GEORGE E. GREGORY was reelected president and general manager of Morton Gregory Corp. at a recent meeting. CLARENCE M. TAYLOR was elected a director to succeed Henry J. Morton who recently withdrew from active participation in the business.

* * *

C. J. HARTER, MACHINERY, has been named Texas representative for National Electric Welding Machines Co., Bay City, Mich. National Electric has also named Rudel Machinery Co., with offices in Montreal, Toronto, Windsor and Vancouver, exclusive Canadian distributor.

* * *

WALTER H. BRAMMAN has joined The Black & Decker Mfg. Co. to handle the firm's line of electric tools in the eastern part of Washington, Montana and Idaho, east of Boise.

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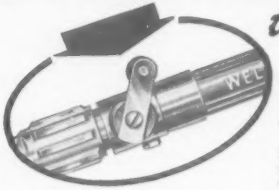
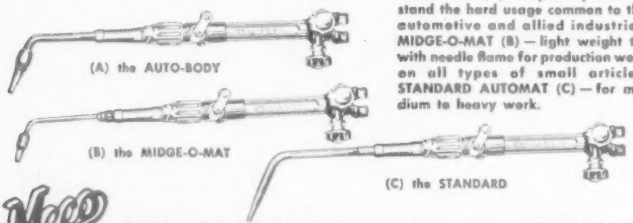


Meco AUTOMAT

The famous MECO "On-Off" Action (above) allows a tiny pilot light to burn at the tip with the action in the "off" position. At a touch it flashes to full production flame. Action tested over 200,000 times without appreciable sign of wear.

For mass production there is no such thing as a good all-round torch. Time and motion studies have proved that for efficient production welding, the torch used must be fitted to its particular job. The Meco AUTOMAT family — embodying the famous MECO "On-Off" action (oval), is perfectly suited to the start and stop welding so common to production. The importance of this time saving feature to mass production work is apparent. Beyond this, each member of this family has built-in features perfectly suiting it to its own particular class of welding.



AUTOBODY (A) — especially built to stand the hard usage common to the automotive and allied industries. MIDGE-O-MAT (B) — light weight tip with needle flame for production work on all types of small articles. STANDARD AUTOMAT (C) — for medium to heavy work.

Meco

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Modern Engineering CO., Inc.

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JAMES F. LINCOLN, president of The Lincoln Electric Co., Cleveland, recently visited several huge sheep ranches in Australia. He reports that much of the welding done in Australia goes to keep up the equipment needed to grow sheep, clip wool and ship it to market.

* * *

An expanding sales program has made necessary the following personnel changes for Sciaky Bros., Inc., Chicago welder manufacturers: GEORGE PALMER, formerly Dayton branch manager, has been moved to Chicago and western territory with JEROME PINSKY, JACK GRAUX and LYLE NOTEBOOM assisting as application sales engineers. LEO GILBERT, formerly of Chicago sales, has been made branch manager of the Dayton office with JAMES HOCK and HENRY JAMES assisting as application sales engineer and service engineer. GEORGE ZEIS has been transferred from Dayton to Chicago to coordinate sales, engineering and manufacturing. JOHN TRENT has been made acting manager of test and service, replacing Mr. Noteboom who transferred to sales.

* * *

RAEMAN P. SOPHER, metallurgist, has been named to the staff of Battelle Memorial Institute, Columbus, O., to conduct research in welding.

* * *

J. "DOUG" CHARTERS, has been transferred to the northern California sales district of Turco Products, Inc., as district sales manager. His office will be in San Francisco. "CHRIS" WILLIAMS, Mr. Charters' assistant district manager in Houston, Tex., takes over as district manager at Houston.

* * *

LOUIS R. BOTSAI has been appointed manager of the motor and control division of Westinghouse Electric Corp., Buffalo. He succeeds LEON R. LUDWIG who has been appointed a member of John K. Hodnette's staff in Pittsburgh.

Died . . .

R. C. BROOM, purchasing agent for Jackson Products, Warren, Mich., died on July 8, 1950.

* * *

FRANK A. BOND, vice-president and secretary of The McKay Co., died July 3 at his summer home in Erie, Pa. He was 66 years old and had been with McKay since 1919. He was active in many technical societies and organizations including the American Welding Society.

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LOW TEMPERATURE WELDING
COMPOUNDS
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FLUXES
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Practically every metal fabricating plant in the country can profit by using ANTI-BORAX Welding Compounds. Whether they are used for actual production work, for making special tools, or for general repair work they will find —as so many other like plants have found—that these products cut the cost of these important operations. ANTI-BORAX Flux and Welding Compounds, though very important, cost very little in comparison to the fine job they do. All ANTI-BORAX Products are *Guaranteed*. Send for descriptive circulars and *free sample*.

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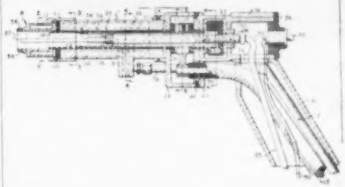
More Than 200 Eye and Face Safeguards
626-I N. Aberdeen St., Chicago 22, Ill.

From the Patent Office

Inert-Arc Welding Gun

2,510,415. PAUL GILBERT PITCHER, Detroit, Mich. Assigned to Sidney M. Harvey, Detroit. Filed Feb. 7, 1949. Granted June 6, 1950.

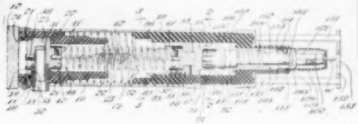


Patent covers an arc welding gun consisting of a hollow barrel and a work-engaging hollow nose piece mounted on one end of it. A handle is secured to the rear end of the barrel. Inside the barrel is an electrode which goes into the nosepiece. Means are provided for positioning the electrode in the barrel. An arc-shielding inert gas is delivered to the nosepiece. The barrel has separate coolant delivery and return passages extending to its front end and the nosepiece.

* * *

Percussion Welding

2,510,101. HAROLD J. GRAHAM, Boston, Mass. Assigned by mesne assignments to Graham Mfg. Corp., Detroit. Filed Sept. 28, 1946. Granted June 6, 1950.



Patent covers an arc welding apparatus consisting of a gun and work-holding chuck and means for forcing two workpieces together by hitting the chuck. A conductor connects the two workpieces to the current supply. Two normally separated contacts are arranged in series so that when they are closed a welding circuit is formed. One contact is carried by the impact means and the other by the chuck. There are means for releasing the impact means to close the contact before applying the blow.

Just Published!
An A to Z treatment of resistance welding which points the way to big savings and increased production

REFLECTING the experience of hundreds of leading shops, this book points the way to the design and production of more efficient metal-made products. It gives you a *complete* picture of resistance welding—what it is; the equipment and materials used; the design, tooling, and production techniques that afford big savings in materials, costs, manpower, etc. Spotlighting modern developments and methods, it shows you thousands of dollars in cost savings.

RESISTANCE WELDING
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By Wallace A. Stanley
Consultant on Product Design, Tooling, and Manufacturing Operations, *Progressive Welder Company*, Detroit
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THIS book brings you valuable shop and tooling "know-how" that you can apply in planning and developing products for resistance welding. It explains how to design for spot welding, projection welding, seam welding, and flash butt welding and discusses tooling, handling, and materials control for various operations.

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Another book of special interest
OXYACETYLENE WELDING and CUTTING
A practical manual showing how to use the oxy-acetylene torch more skillfully in every-day welding jobs. Takes up flame cutting, bronze welding and brazing, the welding of various alloys, modern techniques in pipe welding, etc. By Stuart Plumley. Revised by T. B. Jefferson, Editor, The Welding Engineer. 4th Ed., 345 pages, 8½ x 11, $6.50.

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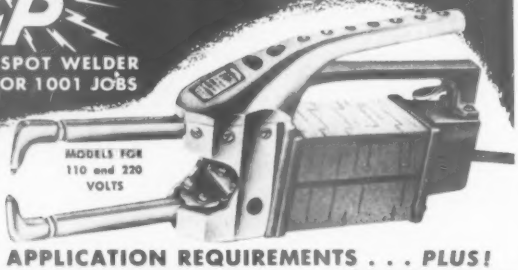

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Perfectly balanced . . . fully portable . . . requires only one hand to operate leaving other hand free for holding or positioning work. The ideal spot welder for auto body and repair shop, metal fabricators, maintenance and light production work.

SEND FOR DETAILS AND DESCRIPTIVE LITERATURE

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AC ARC WELDERS FOR FACTORY, FARM, REPAIR SHOPS

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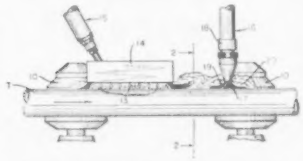
Welded Tubes

2,510,180. HAROLD OWEN JONES, Pleasantville, N. Y. Assigned to Air Reduction Co., Inc., New York City. Filed Feb. 25, 1948. Granted June 6, 1950.

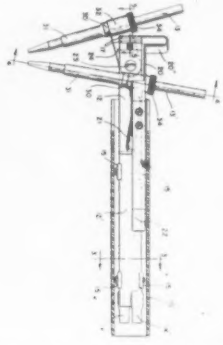


Recently patented method for welding tubes comprises the steps of forming metal skelp to tubular shape, then moving the tube past a preheating and a welding station. At the preheating station, a flame plays against the seam to preheat the edges. The flame and the combustion products provide a gaseous shield around the edges. The edges are arc welded at the welding station under another gaseous shield that forms a continuation of that at the preheat station.

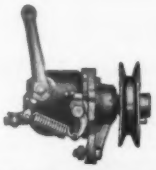
* * *

Twin-Carbon Torch

2,512,509. COLBY WESTON STEWARD, Kenmore and MALCOLM R. RIVENBURGH, Williamsville, N. Y. Assigned by mesne assignments to Cornell Aeronautical Laboratory, Inc., Buffalo, N. Y. Filed Oct. 19, 1946. Granted June 20, 1950.



Patent pertains to a carbon electrode holder having a resilient strip attached to the handle. The strip is flat in a plane transverse to the handle and bent in a plane vertical to the handle. An electrical conductor is attached to the strip as is an electrode holder. A lever is attached to the strip so that the holder can be moved. The lever is operable vertically by the thumb without changing the grip of the hand on the handle. A second electrode holder is carried on the handle.



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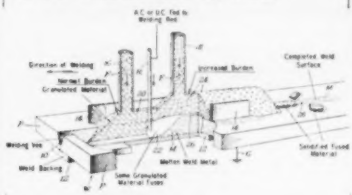
Submerged-Arc Welding

2,511,976. EDWARD L. FROST, Snyder, N. Y. Assigned to The Linde Air Products Co. Filed March 24, 1949. Granted June 20, 1950.

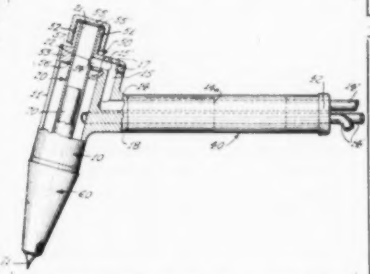


Patent pertains to a submerged-arc welding method that produces an improved weld surface. Method calls for depositing a substantial amount of granular flux on the first flux blanket directly behind and in closely spaced relation to the moving electrode. It should be sufficient to retard the escape of gas along the solidifying metal under the flux. This causes the gas to escape only next to the electrode.

* * *

Gas-Shielded Holder

2,514,060. LOUIS F. HIMMELMAN, Teaneck, N. J. Filed Oct. 3, 1947. Granted July 4, 1950.



Patent pertains to an arc welding torch that is water cooled and carries shielding gas to surround its electrode. The body has water inlet and outlet orifices and a tubular chuck holder. The chuck holder is threaded at its lower end. A handle is integral with the body and is formed with ducts, two of the ducts opening directly into the body in the space surrounding the chuck holder. The third duct connects with the side opening in the chuck holder. An externally threaded chuck fits into the threaded end of the chuck holder. The chuck holds an electrode. A hollow truncated conical shroud is positioned on the lower end of the body to surround the protruding electrode. Water circulates through the body from water inlet orifice to outlet orifice and gas through the third duct. The electrode tip is surrounded by gas.

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REX-A-LITE
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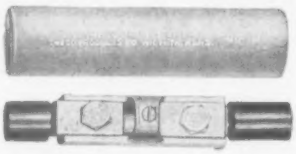

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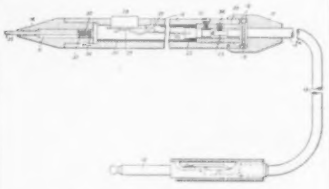
Capacitor Welder

2,510,099. GILBERT GILLIVER, London, England. Assigned to International Standard Electric Corp., New York City. Filed in U. S. Oct. 22, 1946. Granted June 6, 1950.



Newly patented welding equipment is of the capacitor discharge type. It consists of a hollowed, pencil-like tool with an electrode in the pointed end. The electrode may be moved in and out. Two normally closed electrical contacts are within the tool. Means to open the contacts extend through the periphery of the tool.

* * *

Flame Cutting Steel Slabs

2,510,210. JAMES H. BUCKMAN and ROGER S. BABCOCK, Cranford, N. J. Assigned to The Linde Air Products Co. Filed May 26, 1944. Granted June 6, 1950.

Patent covers a method of rapidly flame-cutting steel plates and slabs. A horizontal row of movable post-mixed flame cutting nozzles equally spaced apart are provided. The number of nozzles and the distance they are spaced apart are correlated with the width of the slab and the time interval available in a production cycle for cutting the slab. The row of nozzles is positioned so that the cutting flame orifices of the nozzles are opposite and generally parallel to a horizontal cutting line on the upper surface of the slab. The flame of the leading nozzle is directed at an area on the cutting line that is axially spaced from a leading edge of the slab by a distance equal to the axial distance the nozzles are spaced apart. Preheat flames are applied from the nozzles above the slab surface to spaced areas along the cutting lines. Cutting oxygen jets are applied against the preheated areas to pierce a number of alined and separate kerfs through the slab. After piercing, the row of preheat flames and cutting jets are moved in a single stroke (equal to the distance between nozzles) toward the slab's leading edge. When the cutting jet from the first nozzle cuts through the edge, all following kerfs should merge into a line through the body to sever a portion of it.

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REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (18)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

SELLING OPPORTUNITY OFFERED

WANTED: MAN to represent nationally-known manufacturer of welding supplies in developed territory. Salary, plus commission and mileage. Must have good working knowledge in gas and arc welding. Involves travel. Car ownership and ability to teach will be helpful. Send complete personal details and photo to establish basis for personal contact with advertiser. Address SW 7497, Welding Engineer.

BUSINESS OPPORTUNITY

Wanted: Welding Supply Company
Prefer with oxygen and Acetylene Dealership but not absolutely necessary. Southern or West Coast Area given first consideration. BO 7312, Welding Engineer.

Salesmen for All Territories
To sell welding cable—direct factory connection. Desirable opportunity for men with an established following in the welding industry.

Carol Cable Company
Division of The Crescent Co., Inc.
Pawtucket, Rhode Island

FOR SALE
ATOMIC HYDROGEN
Welding Machine. Price very reasonable.
FS 7490, WELDING ENGINEER
330 W. 42nd St., New York, N. Y.

An Investment!

Productive advertising is an INVESTMENT rather than an EXPENDITURE.

"Searchlight" advertisers almost invariably report prompt and satisfactory results.

BE CONVINCED — Send us your advertisement TODAY.

Address
Classified Advertising Division

WELDING ENGINEER
330 W. 42nd St., N. Y. 18, N.Y.

SEARCHLIGHT SECTION

(Classified Advertising)

EMPLOYMENT: BUSINESS: **"OPPORTUNITIES"** :EQUIPMENT :USED OR RESALE

UNDISPLAYED —RATES— DISPLAYED

(*Not available for equipment advertising*)
90c a line, minimum 4 lines. To figure advance payment count 5 average words as a line.
Individual Employment Wanted advertising rate is ½ the above rates payable in advance.
Box Numbers—Care of publication New York, Chicago or San Francisco offices count as one line.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.

Individual Spaces with border rules for prominent display of advertisements.
The advertising rate is $8.75 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
An advertising inch is measured ⅞" vertically on one column, 3 columns—10 inches—to a page.
New advertisements received by Sept. 15 in the N.Y.C. office, will appear in the Oct. issue.

ARC WELDERS

300 & 400 amps.—G.E. or HOBART
3/60/220 or 440 volts

Reconditioned & Guaranteed
All Current Models

VERY ATTRACTIVELY PRICED

HEAT & POWER CO., INC.
70 Pine St. Digby 8-0373 New York 5

MULTI-ARC WELDING MOTOR GENERATOR SETS

1,000 & 1,500 AMPS.
GE, WEST., CENT., ELEC. PROD.
Synchronous & Squirrel Cage Drives
Complete with Controls.

Write for complete details for these and any other equipment you might desire.

EMPIRE ELECTRIC CO., INC., DEPT. W
87 Jay Street Brooklyn 1, N. Y.

Portable Air Products Oxygen Plant
One New Portable Plant, capacity 1,000 cu. ft. per hour, mounted on Semi Trailer, complete with engine and compressor.
Plant manufactured 1945.
Write for price to
INDUSTRIAL AIR PRODUCTS CO.
3200 N. W. Yeon Avenue Portland 10, Oregon

OXWELD CM-15s, Nat. 5s, Harris K's, Case S-34, AIRCO Oxy-graph, Camographs, Radiagraphs. SEAM WELDER, Progressive 150KVA, New. SPOT WELDER, National, 40KVA for Brass and Stainless. BRONZE STAINLESS, AMPCOTRODES. NO. 12 LENSES, ELECTRODE HOLDERS.
RALL SUPPLY COMPANY
110 E. 42nd St., NYC 17

FOR SALE
OXWELD NOZZLES, complete with tips, No. W-17 and W-22, sizes #4 and #6. Brand new, in orginal boxes, $1.75 ea. 150 of each in stock.
Also, Victor Nozzles, #5, 100 ea. at $1.35.
STRATFORD METAL AND RUBBER CO.
1558 Barnum Ave., Bridgeport, Conn.

Pipe and Tube Cutting Machines
Twenty-five years' experience in building guided torch machines for making curved or angular cuts for welded fabrication.
Correspondence invited on any problem in cutting pipe or tubing from ⅛" — .030 wall to 24" — 1" wall in steel, stainless, cast iron and non-ferrous metals.
FRANK J. DOUGLASS
412 So. California Ave. Monrovia, Calif.

BRAND NEW
SURPLUS! SURPLUS! SURPLUS!
WELDING CONTROL EQUIPMENT

QTY.	DESCRIPTION	PRICE
2 ea.	**Raytheon**, Type SU11, Synchronous Universal Timer Panel complete with Raytheon sequence timer, NEMA type 7B, and phase shift control. Spec. G607, Serial No. 82028 (NEW) ea.	$400.00
15 ea.	**Raytheon**, Type SM11, Synchroonus Seam Timer Panel with phase shift control. Spec. No. G606 (NEW) ea.	200.00
11 ea.	**Westinghouse** Sequence Timer, NEMA Type 7B, West. Style No. 1441726, operating voltage 115/230/460/575, 50/60 cycles (NEW) ea.	50.00
1 ea.	**General** Electric Sequence Timer, NEMA Type 2B, G.E. No. CR-7503F-122-G4 (NEW)	50.00
1 ea.	**Westinghouse** Sequence Timer, NEMA Type 7B, West. Style No. 1186679-B (NEW)	50.00
1 ea.	**Westinghouse** Sequence Timer, NEMA Type 7B, West. Style No. 1186679-C (NEW)	50.00
1 ea.	**General Electric** Sequence Timer, NEMA Type 2B, G.E. No. CR-7502-F-117-G4 (NEW)	50.00
1 ea.	**General Electric** Sequence Timer, NEMA Type 9B, G.E. No. CR-7503F-125-G2 (NEW)	50.00
4 ea.	**Square D** Welding Timer, Class 8991, Type TB81, 440 volt, 60 cycle (NEW)	30.00
1 ea.	**General Electric** Current Regulating Control, G.E. No. GR-7503D-160-G4, control voltage 230/460/575-60 cycle (NEW)	85.00
1 ea.	Same as above except G.E. No. CR-7502D-160-G2 (NEW) with tubes	85.00
1 ea.	**General Electric** Heat Control Panel, G.E. No. CR-7503D-147-G2, 25 cycle (NEW—less tubes)	50.00
1 ea.	**General Electric** Heat Control Panel, G.E. No. CR-7502D-137-G2, control voltage 230/460/370—60 cycle (NEW—less tubes)	40.00
1 ea.	**General Electric** Thyratron Control G.E. No. CR-7507G-122-G4, 115V. 50/60 cycles (NEW—less tubes)	40.00
500 ea.	**Raytheon** Type 1A Welding Timer with #2050 Tubes (NEW)	5.00

Also Many Other Welding Equipment Items
ATTRACTIVE QUANTITY DISCOUNTS
DIAMOND ELECTRIC CO.
928 JEFFERSON AVE. ROCHESTER, N. Y.

STAINLESS STEEL ELECTRODES

at greatly reduced prices.

19,000	lbs.	3/32"	Page	18-8
20,000	"	1/8"	Arcos	25-20
8,000	"	1/8"	Murex	25-20
4,000	"	1/8"	Arcos	18-8
4,000	"	1/8"	Murex	18-8
9,000	"	1/8"	Alloy Rod	19-9
2,650	"	1/8"	Sureweld	19-9
50,000	"	5/32"	Murex	25-20
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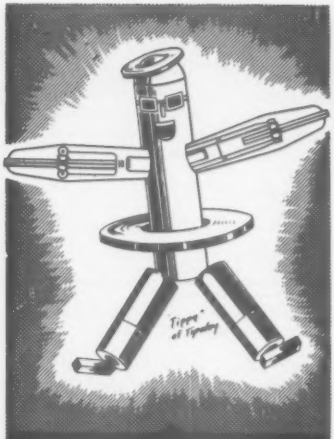
7,000	"	5/32"	McKay	19-9
10,000	"	5/32"	Arcos	19-9
6,000	"	3/16"	Murex	25-20
8,000	"	3/16"	P&H	19-9
30,000	"	3/16"	McKay	19-9
3,000	"	3/16"	Hollup	18-8
4,000	"	3/16"	Cu Zh Bronze	

All Electrodes packed for export.
Write for prices.

INDUSTRIAL AIR PRODUCTS CO.
3200 N.W. Yeon Avenue Portland 10, Oregon



Tipaloy
RESISTANCE WELDING
ELECTRODES

- Longer life.
- Less redressing.
- Less mushrooming.
- Greater current density.
- Extraordinary continuous service under heavy production stresses.
- Cuts production costs, yet costs no more than the ordinary electrode.

Write today for test samples and "The Story of STRAIGHT LINE Conductivity."

Tipaloy INC. 1435 E. MILWAUKEE DETROIT 11, MICHIGAN
Offices in Principal Cities

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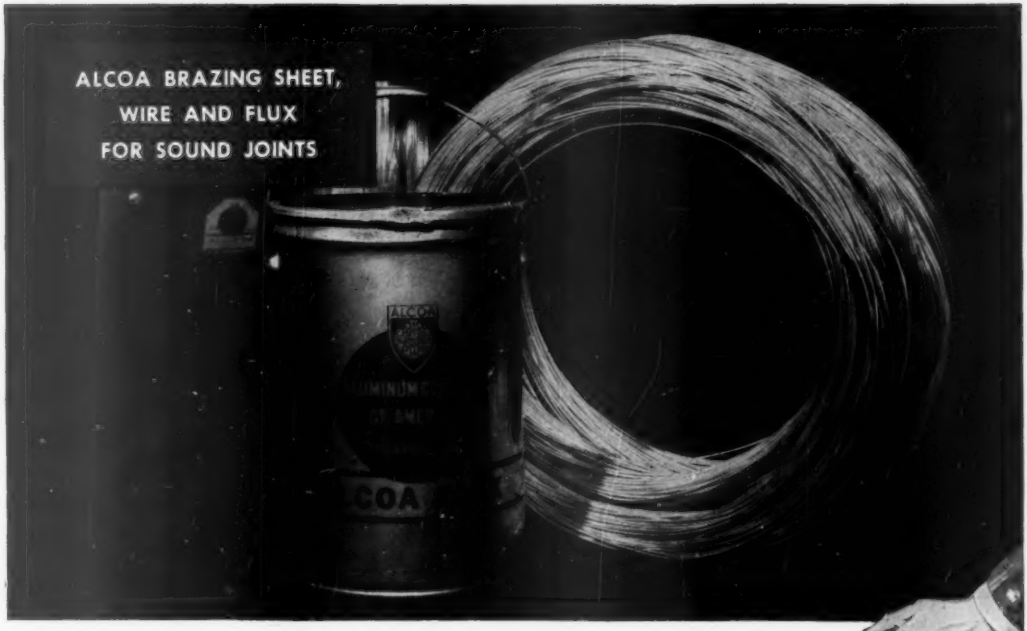

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- Brace-Mueller-Huntley, Inc.
- Whitehead Metal Products Co., Inc.

Charlotte, North Carolina
- Edgcomb Steel Company

Chicago, Illinois
- Central Steel & Wire Company
- Steel Sales Corporation

Cincinnati, Ohio
- Williams & Company, Inc.

Cleveland, Ohio
- Williams & Company, Inc.

Columbus, Ohio
- Williams & Company, Inc.

Dallas, Texas
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- Steel Sales Corporation

Houston, Texas
- Metal Goods Corporation

Kansas City, North, Missouri
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- Pacific Metals Company, Ltd.

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- Edgcomb Steel Company
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Rochester, New York
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San Francisco, California
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Seattle, Washington
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Syracuse, New York
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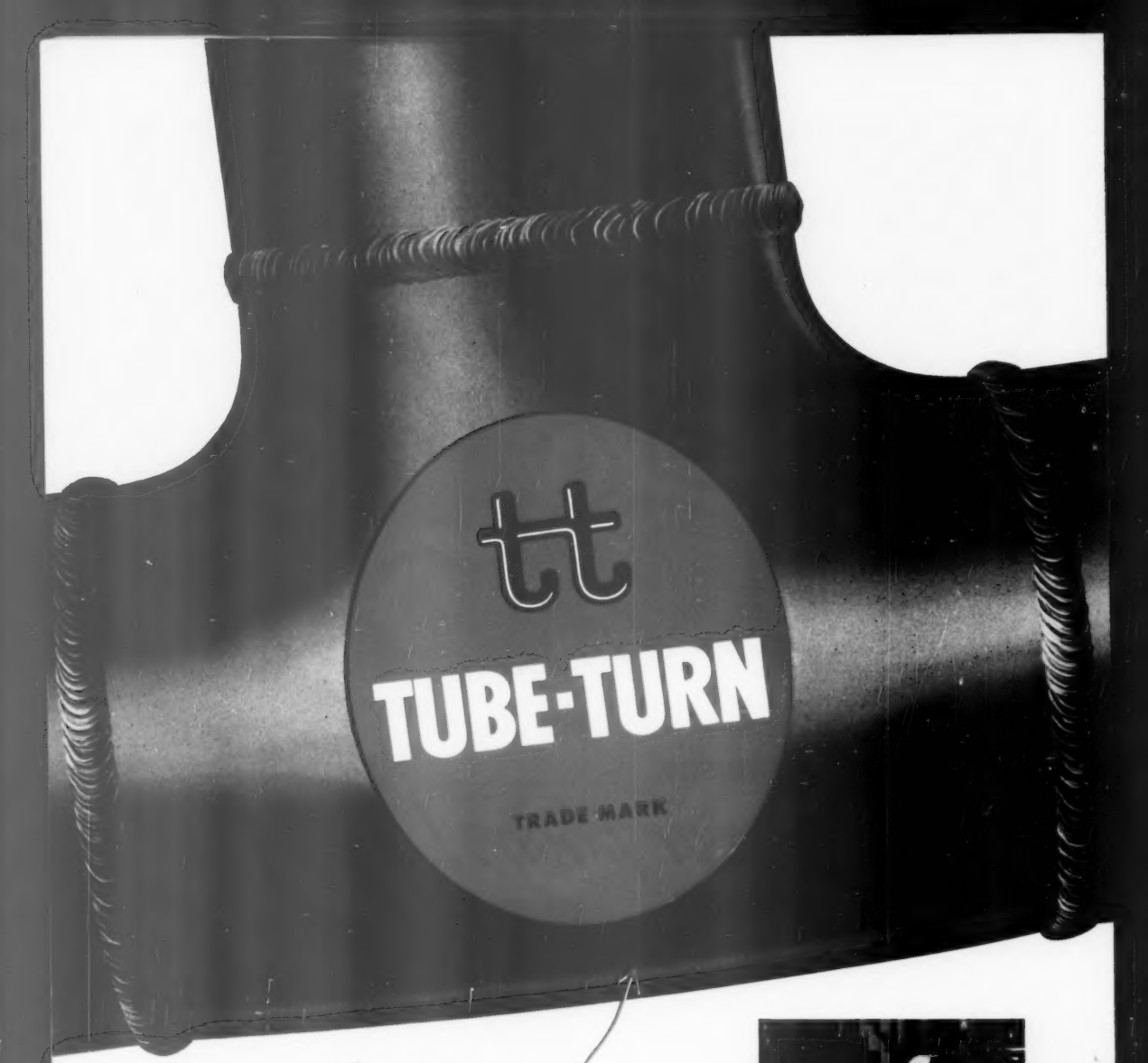

In all the world there's only one TUBE-TURN Welding Fitting as shown by this trade mark... the right mark for every need in welding fittings and flanges.

Your nearby TUBE TURNS distributor can serve you right from stock. Call him for prompt delivery.

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